

THE WORLD BOOK
MODERN
ENCYCLOPEDIA
COMPREHENSIVE
PICTORIAL

In Twelve Volumes

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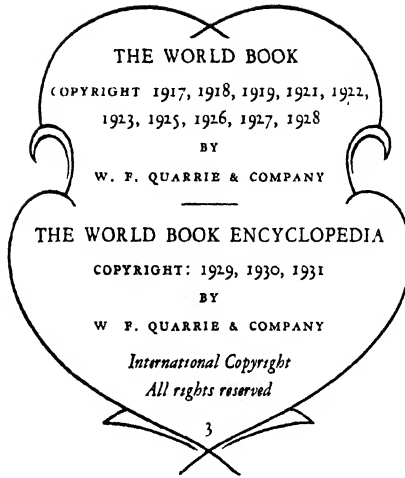
GORDON SAINT CLAIR

ASSISTED BY TWO HUNDRED FIFTY OUTSTANDING LEADERS IN
THEIR RESPECTIVE FIELDS

Volume Two

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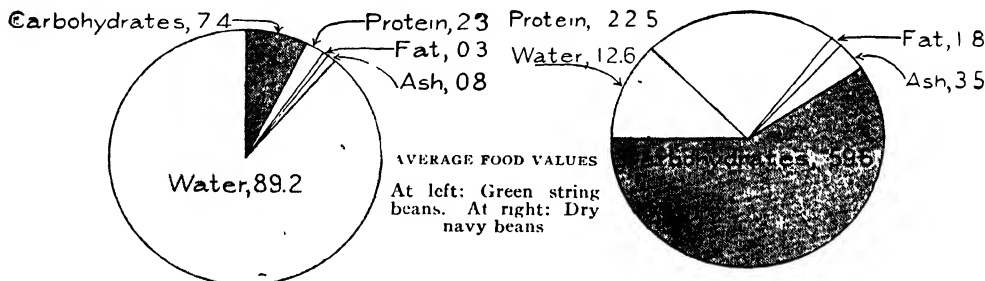
THE WORLD BOOK

MODERN ENCYCLOPEDIA PICTORIAL

VOLUME COMPREHENSIVE TWO

BEAN, the name given to various plants which provide one of the most important vegetable foods for man, as well as excellent forage for cattle and nitrogen for the soil. Some varieties of beans are short, stocky shrubs; others are climbing vines, and the seeds, also

familiar red kidney bean, but almost all of the so-called "string" beans, whether green-podded or wax-podded, of which the entire pod with its unripened seeds is eaten. To the kidney beans, too, belongs the *navy bean*, the basis of the famous "Boston baked beans."



called beans, vary in size, shape, and color. The two halves of the bean seed are the *cotyledons*, and these are the first leaves that are thrust through the soil after the seed sprouts. In whatever way the seed is sown, the root always grows downward, while the leaves climb up toward the sun. The flowers of beans, whatever their color and size, are alike in shape, the most insignificant blossom on the garden bean being almost exactly like the bright-red winged flowers of the scarlet runner. The seeds of all varieties are borne in pods, and this characteristic, with the butterfly shape of the blossoms, shows that the bean belongs to the same family as the pea—the pulse family. See COTYLEDON.

Food Value. As stated above, beans, whether green or dried, have a high food value; it has been estimated that in no other form can so much nutriment be bought at so low a price as in the so-called navy beans. Because beans are rich in protein, they are particularly well adapted to take the place of meat; therefore, when baked beans are served, it is wise to omit meat from the bill of fare. Frequently the statement is heard that the Japanese and Chinese live largely upon rice, and thus have a diet deficient in protein, but the soy bean, in some form, perhaps merely as a sauce for the rice, is present at almost every meal, and supplies the necessary protein constituent.

Kinds of Beans. In the United States and Canada, the best known of all beans is probably the *kidney bean*, of which many varieties are cultivated. These include not only the

The *lima*, introduced from Peru, as the name indicates, is another important bean, distinguished by its slender, vinelike growth and its large pods with their broad, flat seeds. These are much used both when green and when dry. In Mexico there is a little dark-colored bean, called the *frijole*, which may almost be said to constitute the national dish. From the tables of the poor, especially, these beans, highly seasoned with red peppers, are rarely absent.

But America is not the only country which produces important beans; from China and Japan have been introduced the *soy bean*, which in those countries is a staple food article. In America, this bean is grown, however, chiefly as forage and as a restorer of nitrogen to the soil; for it has in even greater measure than most members of the pulse family that peculiar ability of utilizing the nitrogen of the air through the action of bacteria in the little tubercles on its roots.



GOLDEN WAX BEAN

Enemies. The bean has one very dangerous insect enemy—the bean weevil, a little dark-gray beetle, which lays its eggs on the growing pods. The damage done by the grubs to the green plants, however, is small compared with that which they do to the dried seeds. If the seeds are infested, they should be subjected for thirty minutes to a temperature of 125° F. This heat will kill any form of insect life present, and not harm the beans.

Another enemy of the bean is the fungus disease called *anthracnose*, which causes considerable damage to growing beans by spotting and shriveling the pods and discoloring the seeds. Investigation has shown no very satisfactory method of dealing with this pest; the greatest care should be exercised in selecting seed for planting, as the disease may be transmitted from generation to generation through infected seed.



ROOT OF BEAN PLANT
Nodules are shown which contain nitrogen-fixing bacteria

and Colorado usually lead, both in acreage and production. In Europe, Italy, Spain, Austria, and the United Kingdom are heavy producers of beans. Throughout Europe, green string beans are a staple summer vegetable.

B.M.D.

Scientific Names. Beans belong to the family *Leguminosae*. The common bean is *Phaseolus vulgaris*; the lima, *P. lunatus*; the soy, *Soja hispida*; the frijole is a variety of *Phaseolus vulgaris*.

Related Subjects. The reader is referred in these volumes to the following articles:

Bean Beetle
Fertilizer

Nitrogen
Protein

BEAN BEETLE, also called **MEXICAN BEAN BEETLE**, has been a pest in certain parts of Colorado for about seventy-five years. It was discovered near Birmingham, Ala., in 1920. The conditions in the East have been very favorable for the insect, for it has spread to practically all of the Eastern and Central states, and has been reported as far north as Southern Canada.

The Mexican bean beetle belongs to the group of insects known as ladybird beetles (see **LADYBIRD**); the adult is about the size of a small pea, yellowish or reddish in color, with eight small, dark dots upon the back of each wing cover; these vary in size and outline. The larvae are bright yellow, one-eighth to three-eighths inch in length, and are covered with spines. The larva is described by farmers as "woolly." Both the adults and the larvae feed almost entirely on the under sides of the leaves.

The insect in the adult stage passes the winter beneath rubbish and trash, in some sheltered place. The beetles usually become active in March or April. The eggs are deposited in masses on the under surfaces of the leaves or on near-by plants; they are yellow in color, and they hatch in five to eight days. The growth of the larva in the early spring is slow, but in mid-season it reaches maturity in about two weeks, after which it pupates. The pupa stage lasts only four or five days, at the end of which period the pupal covering splits, and the adult bean beetle emerges. In Alabama, the adults mature in four to five weeks from the time the eggs are laid, and there are four broods of beetles during the season. The adult beetles are strong flyers, and by this means they are able to infest new areas.

The pest is found on all varieties of bush and pole beans, snap beans, lima or butter beans; and when they are very numerous and beans are not to be had, they have been known to feed on beggar-weed, cowpea, hyacinth bean, soy bean, Adzuki bean, sweet clover, and alfalfa. The insect prefers common beans, including bush and pole beans, navy and lima beans.

Perhaps the most important reason why the bean beetle has gone unchecked and little or

Figures Represent Thousands of Bushels



PRODUCTION IN LEADING STATES

The figures are based on the average crop for four years.

World Production. The United States is one of the most important field-bean-producing countries in the world; Michigan, California,

no effort has been made to control it is because many people have been afraid to use beans after the plants have been dusted with arsenical poison. The beans should be carefully washed, and all traces of the poison dust should be removed before they are cooked. At the Alabama Experiment Station a chemical analysis of several samples of dusted beans was carefully made, and it was found that, in order to get a fatal dose of arsenic, a person would have to eat forty pounds of green beans.

Methods of Control. Garden beans may be effectively protected from bean-beetle injury by hand-picking the beetles when they first appear. If the beetles are destroyed as they arrive and before the eggs are deposited, the injury can be kept at a minimum. This method of control would be practical on only a few rows of beans.

Calcium Arsenate and Hydrated Lime. Calcium arsenate, diluted at the rate of one part of the arsenic to seven parts of lime, is recommended as the most readily available material for dusting beans. This combination has now been used with satisfactory results for several seasons. It is essential that the material should be applied to the under sides of the bean foliage, as the beetles and larvae feed almost entirely from underneath, and it is a waste of energy and materials to dust the poison on the upper sides of the plant. This may be accomplished with an angle nozzle, so arranged that the dust is directed upward.

Calcium arsenate may be applied in the form of a spray according to the following formula: calcium arsenate, three-fourths pound; hydrated lime, one and one-half pounds; water, fifty gallons. W J S

[The scientific name of the bean beetle is *Epilachna corrupta*. It belongs to the family *Coccinellidae*.]

BEAN TREFOIL. See LABURNUM.



B The STORY of BEARS

BEAR. To dwellers in North America, probably the most interesting and certainly the best known of all the larger wild animals is the bear. There are three reasons for this. First, bears have always been plentiful in all parts of the continent where civilization has not pressed too closely; second, they remain well and strong in confinement, and are thus to be seen in any "zoo," no matter how small it may be; and third, they are easily trained and taught to do many simple things.

Appearance and Habits. Bears are shaggy beasts, much like huge dogs, but they have more massive bodies, broader heads, and teeth fitted for grinding as well as for tearing. Their bodies look more bulky than they really are by reason of the loose skin, long, coarse hair, and short legs; and since they walk flat on the soles of their feet instead of on their toes, they have none of the lightness

HEAD OF GRIZZLY BEAR



KING OF THE NORTH

The photograph used for the panel heading in this article was taken by Donald B. MacMillan at Etah, Greenland, where he passed the winter of 1923-1924 in the *Bowdoin*. See MAC MILLAN, DONALD BAXTER

and gracefulness of movement which distinguishes other flesh-eaters—the dog family and the cat family, for instance. But their awkwardness is apparent rather than real, for they can move very rapidly, over either smooth ground or steep and dangerous rocks; and most of them can climb a tree with astonishing ease and nimbleness. This statement, however, is not true of the grizzly bear, which is not a climber. In the Arctic regions, too, bears have never learned to climb, for the very good reason that there are no trees there.

Though bears are classed as flesh-eating animals (see CARNIVOROUS ANIMALS), they have excellent appetites, and can eat almost

anything. Small animals of the woods, lambs and little pigs from unprotected farms, fish, grubs, and eggs are most attractive, but if these are not at hand, fruits, nuts, herbs, and roots form a satisfactory substitute; and honey appeals so strongly to their taste that they will risk getting well stung in order to make a meal of it. Their sense of smell is very well developed; their hearing is moderately good; but their little eyes do not serve them well.

Unlike the wolves and foxes, the bears do not live and hunt in packs. Kipling, in his *Jungle Book*, was true to nature when he gave to his wolves the "law of the pack," but made his great bear a solitary creature. A bear family has its cave in some rock crevice, under heavy brush, or in a hollow tree; and there the father and mother bears spend the winter (see *Winter Habits*, below.) In spite of much that is said to the contrary, most bears are not cowards. Bret Harte, who lived in the Western country and should have known whereof he spoke, wrote of the grizzly as "Coward, of heroic size," but hunters agree that a bear is not an enemy to be lightly considered. Most bears are good-natured, it is true, and do not begin a fight unless they are provoked to it, or fear that their young are in danger; but once aroused, they show a tremendous strength, against which little but a quick-shooting rifle can prevail.

The "bear's hug" is a very real thing; natives of the countries where bears live know this, and they prefer to capture or kill the animals during the winter season, when they are sleeping, or are at least sluggish.

Value to Man. Uncivilized peoples have always regarded bear's

meat very highly, and the most modern hunters find that it is of fine flavor. The fat, moreover, is of use, for though "bear's grease" is no longer popular for the hair, as it was two generations ago, other ointments are made from it; but the skin is the most valuable part of the animal. The skins of large bears, carefully dressed and mounted, bring good prices.

Winter Habits.

While the statement is commonly made that the bear hibernates, or passes the winter in a state of stupor, this is not true in the sense in which it is true of the snake, for instance (see *HIBERNATION*). In cold countries, most bears do retire to their caves and sleep there through the winter, waiting the return of spring and a new food supply, but they do not become torpid. The hibernation of the female is much more complete than is that of the male; the latter frequently prowls about at night during even the coldest weather.

The cubs, usually two in number, are born during the winter sleep of their mothers,

and when the female comes out in the spring, she is almost unable to walk. She takes the greatest care of her young, however, until they are fairly large; there are few animals more dangerous to meet than a mother bear, angered by any injury done to her cubs. The grizzly

bear hibernates very little, and the polar bear, despite the coldness of its dwelling place, not at all.

Kinds of Bears. Almost all the bears live in North America, Europe, or Asia, though South America has one species, the *Andean*; and Africa has the *Atlas bear*.

Most distinctive of all the species is the *polar*, or *ice bear* of the Arctic regions. It is a wonderful example of the adaptation of an animal to its surround-



Photo Courtesy of Nature Magazine

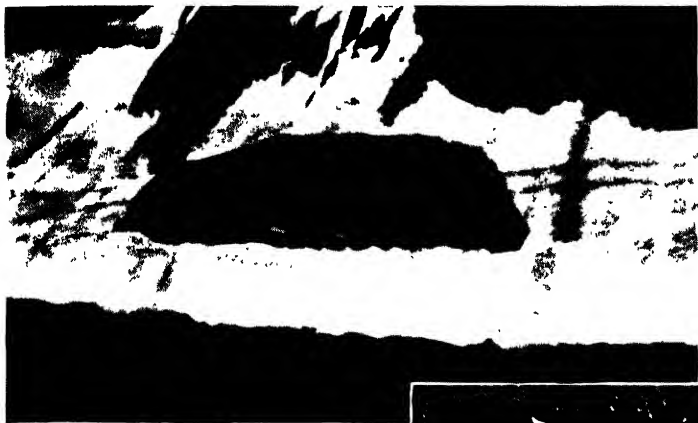
CUFFY AND TUFFY

They are very busy helping Mr. Finley of the Bering Sea Expedition of the American Nature Association. These cubs were so friendly that they were usually in his way (Photograph by Irene Finley)

HEAD OF KODIAK BEAR



ings, for its creamy-white color makes it possible to creep practically unseen upon its prey, which would quickly be aware of an approaching enemy of any darker color. This is an



PERFECTLY HAPPY

A member of the zoo in Central Park, New York, thoroughly at home on the snow-covered roof of his rocky cave. The former polar king, at the right, is in Franklin Park, Boston. He is shown at luncheon in the icy waters of his swimming pool.

exceptionally large bear, which often attains a length of nine feet or more and a weight of 1,000 pounds. It has a long, pointed head, slender limbs, and large black feet. It lives chiefly on seals and fish, which latter it has little difficulty in catching, as it is an excellent swimmer. Polar bears are much seen in "zoos," and seem to thrive in temperate climates.

The *grizzly bear* of the mountains of Western North America is one of the largest and most savage of the family; indeed, hunters consider it the most dangerous animal of the continent. Formerly it was to be found anywhere from the Black Hills westward, and from Mexico to Northern Alaska, but the advance of civilization has forced it to withdraw to the high mountains and deep forests. Once it was the enemy of the buffalo and the deer, and until recent years the cattle and horses of Western ranches were not always safe from its raids. Unlike most bears, it does not sleep during the winter, but ranges day and night for its prey. The grizzlies vary in color, some being brownish-yellow, some gray, and some reddish-brown. The two latter classes receive special names—the gray are known as *silvertips*, the reddish-brown as *cinnamon* grizzlies. A full-grown grizzly may be nine feet or more in length, and may weigh 1,000 pounds. Yellowstone National Park has some fine specimens.

The *brown bear* of Europe and Asia is the *Bruin* of the children's stories, for *Bruin* merely means *brown*; and this is the bear which is most often seen in menageries or with strolling musicians, who teach it to dance clumsily and to perform tricks. The children of North America are not so familiar with these performing bears, but every village of Europe receives frequent visits from the bear-tamers and their pets. It was this animal which in earlier days in England was so cruelly baited—fastened to a stake and compelled to fight a pack of dogs—and doubtless the "three bears"



Photos U & U; Wide World

whom Goldilocks met in the wood were of this species.

The Swiss city of Bern takes its name, a shortened form of the German word for *bears*, from the tradition that many bears were killed on the day the city was founded; and to this day, bears are kept by the city government in a den or pit in memory of this old story.

The *black bear* is yet to be found in parts of North America where large stretches of forest remain. It is smaller than the grizzly, and is not always black, many species being brown or reddish-yellow. Not dangerous unless enraged, and inclined to be playful, the black bear is nevertheless hated and feared, for it is a persistent thief of pigs and sheep.

The *Kodiak*, or *Kadiak*, bear, the largest bear of all, lives on Kodiak Island, Alaska, and is related to the grizzly. While other species of bears are being gradually exterminated, this one is still numerous, and bids fair to remain so, since it is one of the most dangerous



Photos Rainier National Park; Wide World

APPARENTLY HAPPY, WHETHER FREE OR CAPTIVE

A large black bear and her two cubs in Rainier National Park. At right, Minka, a brown bear in Franklin Park, Boston, surveys her little world.

Outline and Questions on the Bear

I. Appearance

- (1) Size and shape
- (2) Loose skin, long hair
- (3) Apparent awkwardness

II. Habits and Senses

- (1) Food
 - (a) Flesh
 - (b) Other food
- (2) Special senses
- (3) Solitary habits
- (4) Strong maternal instinct
- (5) Dangerous enemy when aroused
- (6) Winter habits
 - (a) Period of stupor
 - (b) Hibernation of female

III. Kinds of Bears

- (1) Polar bear
- (2) Grizzly
 - (a) Silvertip
 - (b) Cinnamon
- (3) Brown bear
- (4) Black bear
- (5) Kodiak bear

IV. Value to Man

- (1) The flesh
- (2) The fat
- (3) The skin

Questions

What is the largest of all bears? Is it dangerous?

How do hunters regard the grizzly bear as to its ferocity?

When do natives prefer to capture bears?

In what way are the looks of a bear deceiving?

What kind of a bear is the "Brun" of the stories?

What sense guides a bear in its search for honey?

Why are bears better known than most wild animals?

Why are some people under the impression that bears are cowards? Is this a correct supposition?

What advantage to the polar bear is its color?

Why do farmers especially dislike the black bear?

What city in Europe is named for bears, and why?

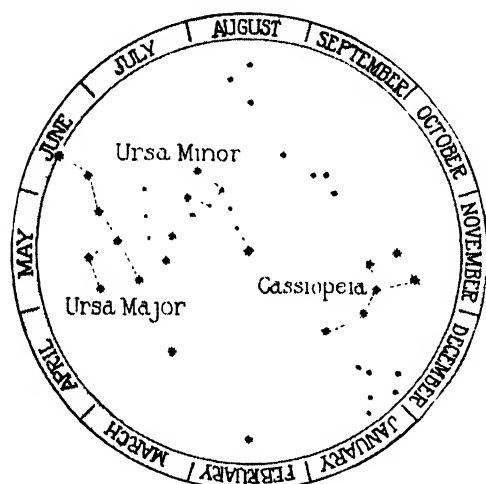
What are the winter habits of most bears?

What book of Kipling's makes clear one peculiarity of the bear?

of all beasts of prey. The Kodiak is the "big brown bear" of North America, for individuals exhibit different combinations of dark- and yellowish-brown. M.J.H.

Classification. Since color is no clue to species, varying in one group of bears and even in one litter of cubs, naturalists have found it difficult to classify the North American bears, though the four distinct groups are generally agreed upon. The bears constitute the family *Ursidae*. The polar bear is classed as *Ursus maritimus*. The common grizzly is *Ursus horribilis*. Various sub-species or varieties of grizzlies have been named, and such classification has been attempted also for the black bear, *Ursus americanus*, and for the Kodiak, *U. gyas*. The European brown bear is *U. arctos*.

BEAR, GREAT, the name of the most conspicuous constellation in the northern heavens,



GREAT BEAR

(See, also, drawings in ASTRONOMY)

usually named *Ursa Major* by astronomers. The Great Bear contains six stars of the second magnitude and one of the third, so arranged as to form the outline of a dipperlike figure, with a handle of three stars. The two stars forming the end of the dipper are called *pointers*, as a line drawn through them and continued toward the Pole will almost touch the polestar.

In the United States and Canada, this group of stars is known as the Big Dipper, to distinguish it from the Lesser Bear, or Little Dipper, which contains the polestar (which see). In England, the Dipper is called the Wagon, the Wain, and the Plow. The accompanying illustration shows the relative positions of the Great and the Little Bear. Held with the month at the top, the positions will be approximately correct at eight o'clock in the evening. F.B.L.

In Mythology. According to mythology, the Bear is Callisto, daughter of Lycaon, king of Arcadia, who,

arousing the jealousy of Juno, was changed into a bear. Jupiter afterwards placed her in the heavens with her son Arcas, the Little Bear. See MYTHOLOGY.

BEARD, beard. The beard is the growth of hair on the face, especially on the chin and cheeks. Formerly, the moustache was considered a part of the beard. In ancient times, a beard was regarded as a mark of full manhood. Slaves and eunuchs were beardless objects of contempt; women unfortunate enough to grow beards were regarded as witches.

Styles During the Centuries. The Egyptians, with intense love of cleanliness, shaved their faces except in times of mourning. The Greek philosophers were long-bearded men; they thought that they derived added dignity from the luxuriant growth. Shaving was introduced into Greece by Alexander the Great, who ordered his soldiers to remove their beards, which might otherwise be seized by their enemies in battle. Before the Norman Conquest, it was customary for the Saxons to shave their chins and cheeks, but to allow their moustaches to grow. The Normans were clean-shaven, their hairless faces causing the Saxons to call them an army of priests. The Japanese for centuries shaved clean, but, even in Nippon, fashions change, and beards and moustaches are sometimes seen there. In the United States and Canada, the beard is not fashionable at the present day, by far the greater number of men being clean-shaven, or wearing only a moustache.

A Note from History. The beard appears a trivial matter to be the cause of a bloody war. Yet it is said that the shaving of the beard of Louis VII of France brought about a war with England that lasted 300 years. His wife, Eleanor of Aquitaine, objected to a beardless husband. The king divorced her, and she became the wife of Henry II of England. Her dowry of Aquitaine and other lands made the latter more powerful in France than Louis himself, and war was begun. The throne of France was afterward claimed for her descendants.

BEARD, DANIEL CARTER (1850-), an American naturalist, artist, and writer, founder of the first Boy Scouts' society, upon which the English society and the national organization in the United States were modeled. When the Boy Scouts of America were organized, they chose Beard as their national scout commissioner. He was also at one time president of the Camp Fire Club, an association of sportsmen, authors, and artists.



Photo: U & U

DANIEL CARTER BEARD

Beard was born at Cincinnati, O. He studied at Covington, Ky., and at the Art Students' League in New York, and became known as an illustrator of books and magazine articles. He also had classes in art, that at the Woman's School of Applied Design being probably the first class ever organized in animal drawing. Mount Beard, near Mount McKinley, is named for him, though it is by no means certain that he discovered it. See BOY SCOUTS.

His Books. Beard wrote the *American Boys' Handy Book*, *Dan Beard's Animal Book*, *Jack of All Trades*, *Field and Forest Handy Book*, *Boy Pioneers*, *Sons of Daniel Boone*, *Building and Boating*, and *Buckskin Book*.

BEAR RIVER. See UTAH (Rivers and Lakes)

BEARS AND BULLS, names popularly associated with the two classes of brokers or operators on the stock exchange and the board of trade. The names are applied to brokers because of the characteristic method of attack used by those animals, the bears and the bulls. The bear uses his claws and tries to tear down his prey; the bull tosses it up with his horns. So a stock exchange bear is one who tries to force prices down, while a bull tries to force them up.

A bear sells stock or bonds or grain, thus trying to create a supply that exceeds the demand. If he succeeds, the price naturally falls, and he can buy back the securities or grain at the lower price. His profit is the difference between the price at which he sold and the price at which he bought.

The bull, on the contrary, is always trying to keep prices going upward. He buys when prices are low, but to make a profit he must force the price to a higher point. The bull, who wishes to maintain or raise prices, must buy all that the bear offers. If he fails to do so, the price will begin to fall. The operation of the exchange is much like the seesaw. When the bear is on the high end, he makes every effort to get down—that is, he sells in order to lower prices—while the bull tries to keep him up. Both sides cannot be up at the same time, and when one side goes up, the other must go down. If the general tendency of prices is downward, the market is usually said to be a *bear market*; if the prices are rising, it is a

bull market. See STOCK EXCHANGE; BOARD OF TRADE.

BEAR STATE, one of the popular names of Arkansas (which see).



Photo Visual Education Service

DANTE AND BEATRICE

BEATRICE, NEB. See NEBRASKA (back of map).

BEATRICE PORTINARI, *be'-a tris por te nah'-re* (1266-1290), the poetical idol of Dante, made famous for all time by his *Vita Nuova* (New Life) and *Divine Comedy*. She was the daughter of a wealthy citizen of Florence, and the wife of Simone dei Bardi. She was

but nine years of age when Dante met her first, at the house of her father, and he saw her only once or twice throughout his life, but his love for her dominated his genius. He loved her as saint rather than as woman, however, and in his *Divine Comedy* makes her his guide through the highest heaven. See DANTE.

BEATTY, DAVID (1871-), first Earl Beatty and in 1919 first sea lord of the British navy, was born in Ireland. Although he rose rapidly from post to post in his chosen career in peace time, the World War gave him the opportunity for most conspicuous service and consequent honors. In 1898, he was a commodore; in 1910, a rear admiral; in 1915, a vice admiral; in 1916, commander in chief of the Grand Fleet; in 1919, an admiral, and in the same year admiral of the fleet. In the year 1919, also, he was raised to the peerage, given the Order of Merit, and made first sea lord.

In the war, he distinguished himself in the battles of Helgoland (1914), Dogger Bank (1915), and in the great Jutland encounter (1916), in which he gained the praise of the allied nations. In 1918 he was appointed to receive the surrender of the German fleet in the Firth of Forth. The British government sent him as one of its representatives to the disarmament conference in Washington (1921).

In 1901, Lord Beatty married an American woman, Ethel Field, daughter of the late Chicago merchant, Marshall Field.

BEAUBRUMMELL, *bo brum' 'l*. See BRUMMELL, GEORGE BRYAN.

BEAUFORT, *bo' fort*, **WIND SCALE**. See WIND.

BEAUMARCHAIS, *bo mahr sha'*, PIERRE AUGUSTIN CARON DE (1732-1799), a famous

French wit, politician, and dramatist, whose literary reputation is due mainly to his brilliant and amusing comedies, *The Barber of Seville* and *The Marriage of Figaro*. The popular opera by Rossini, bearing the title of the former, is adapted from Beaumarchais' comedy.

He early showed musical ability, and for a time he taught harp-playing to the daughters of Louis XV. In 1774 appeared his celebrated *Mémoires*, written to uphold his side in a lawsuit. They were greatly enjoyed because of their wit, satire, and liveliness. The best of his other writings is a drama entitled *Eugénie*. Beaumarchais had a remarkable liking for notoriety, and, among several other exploits, supplied the Americans with arms and ammunition during the Revolutionary War.

BEAUMONT, *bo' mont*, FRANCIS (1584-1616), AND **FLETCHER**, JOHN (1579-1625), two English writers who were prominent figures among the dramatists of the age of Shakespeare. Their names are always associated, because they worked as literary partners. The particular share that each had in the writing of most of their plays is difficult to ascertain. Beaumont seems to have been the stronger and more dignified in the art of composition, but Fletcher was the superior poet.

Though in their own period their plays were fully as popular as Shakespeare's, they represent the beginning of the decline of the English drama. In them, character-drawing sank to a low level; the men and women of these writers were so unnatural and overdrawn that they bore no comparison with Shakespeare's lifelike creations. Further, though clever and amusing, their plays were greatly marred by coarseness. To the modern reader, they are attractive chiefly by reason of the beautiful lyrics which they contain.

What They Wrote. Of the fifty or more plays which these writers produced, *Philaster* and *The Maid's Tragedy* are known to be largely the work of Beaumont, *The Faithful Shepherdess*, containing much delightful poetry, is attributed to Fletcher.

BEAUMONT, TEX., the county seat of Jefferson County, near the eastern boundary of the state, eighty-four miles northeast of Houston. It is on the west bank of the Neches River, and is connected with the Gulf of Mexico, forty-nine miles distant, by the river and canals. Beaumont was settled in 1836, was chartered as a city in 1899, and is governed by the commission-manager plan. The population, which was only 9,427 in 1900, increased to 57,483 at the 1930 census, a growth caused by the development of extremely rich oil fields and annexation of territory.

Industries. Beaumont is one of the principal lumber-shipping centers in the South, particularly of yellow pine. Here are the famous Spindle Top oil

field, and eleven others, necessitating many large refineries. The city is also in a richly productive rice belt, and has several large rice mills. Manufacturing is devoted principally to by-products of lumber, rice, and petroleum.

Transportation. Beaumont is accessible to ocean going vessels by way of the Sabine-Neches Waterway completed to a depth of thirty feet in 1926. The city is served by four trunk lines—the Southern Pacific, the Santa Fe, the Missouri Pacific, and the Kansas City Southern. The Eastern Texas Electric Company also serves Beaumont.

BEAUREGARD, *bo' re guhrd*, PIERRE GUSTAVE TOUTANT (1818-1893), a Confederate general who began the War of Secession by the bombardment of Fort Sumter. He was born in New Orleans, was graduated at West Point, and after distinguishing himself in the Mexican War, returned to West Point as its superintendent. In February, 1861, two months after his appointment to that post, he resigned to enter the Confederate army. His activities after the famous attack on Sumter included the winning of the first Battle of Bull Run, the command of the Confederates in the hard-fought Battle of Shiloh, and the defense of Charleston against naval attacks. After the war, he was president of the New Orleans, Jackson & Mississippi Railroad; adjutant-general of Louisiana; and for some time manager of the famous Louisiana Lottery. For accepting this post, he was severely blamed, as the lottery was in evil repute, and it was later suppressed by the Louisiana legislature. See FORT SUMTER; WAR OF SECESSION.

BEAUVOIR, *bo vuar'*, the home of Jefferson Davis (which see). See, also, CONFEDERATE ARMY SOCIETIES.

BEAUX, *bohzh*, CECILIA. See WOMEN. TWELVE GREATEST AMERICAN.

BEAVER. The life history of this master-workman among land-and-water animals reads like that of some modest, industrious race of people. Beavers played an important part in the early history and settlement of the United States and Canada, and at one time they were so common that their pelts were used as a substitute for money. The term *skin*, used as a standard measurement in fur-trading posts, was based on the size of the pelt of a full-grown, perfect beaver, which, when cured, weighed sixteen to twenty ounces. Traders in remote districts still use sticks to represent this measurement. Though laws are in force for their protection, North American beavers are rapidly decreasing in number, except in sections where laws against poaching are vigorously enforced; where they are protected by law, their number is increasing. In Europe there are few left. Their fur is valuable.

Distinguishing Characteristics. Beavers are the largest of the North American rodents, and they are certainly the most interesting and



Photos Visual Education Service; American Museum of Natural History

"AS BUSY AS A BEAVER" IS MORE THAN A FIGURE OF SPEECH

At left is shown the manner in which a beaver fells a tree; the ax was driven into the wood before the photograph was taken, in order to show somewhat clearly the size of the tree. At right, the beaver in his natural surroundings. The picture is a habitat group in the American Museum of Natural History, New York City.

intelligent of this order of gnawing creatures. In structure, they are closely related to the squirrel, and in habits, to the muskrat (see SQUIRREL; MUSKRAT). Adult beavers are about two feet long, from nose to root of tail, and weigh thirty-five pounds or more. The tail is about ten inches long. It is thick and oval-shaped, and flattened horizontally for about half its length. The tail is naked of hair, but is covered with scalelike, horny skin. It acts as a rudder and an oar when the animal is in a pond or stream, and when slapped on the water it sounds a loud signal to announce the presence of danger. Beavers have small eyes, short ears, blunt noses, small squirrel-like forefeet, and large webbed hind feet.

There are two kinds of hair. The upper, which is long, coarse, and glossy, is removed before the skins are placed on the market. The under hair, that which is commercially valuable, is short, thick, soft, and silky. Beavers are generally of a chestnut-brown color, but some are black, and others are white. Most interesting of beaver characteristics, and the outstanding mark of kinship with other rodents, is the possession of cutting teeth (incisors), two in each jaw. They are large,

strong, and sharp, and are curved into a semi-circle. The fronts of these teeth are of hard enamel; the backs are softer, and are easily worn away, so a chisel-like edge is always kept, for the teeth also continue to grow as they are worn away. The cutting teeth are to the beaver what an ax is to the woodman, for with their aid trees of considerable size are felled.

Life and Habits. The favorite haunts of beavers are forest-bordered rivers, lakes, and streams. Though they occasionally live singly or in pairs, beavers are sociable creatures, and usually live in colonies. Their homes are substantial, cleverly built structures, made of branches of trees plastered with mud, grasses, and other materials. These dwellings are built in the water or on the water's edge, and are called *beaver lodges*. Sometimes they are three feet high and seven feet across. The walls are substantial enough to afford protection against the cold of winter as well as against the average beast of prey. There are two rooms, and always



THE BEAVER

On top of his home, where he can survey his domain.

two entrances, both leading into the water. The lower room is used for storage of food; the upper one is the living room. The upper chamber is dry, and is supplied with air through an opening at the top. This opening, however, is concealed

by a mass of sticks which the beaver carefully arranges. If the chosen stream is not very deep, a dam must be built to form a pond about the home, to insure continuous entrance through water, in spite of summer's drought or winter's ice and snow.

Systematically and steadily, the work of home-building and the making of dams goes forward. When the home site has been chosen, the entire colony, young and old, busy themselves at felling trees. Deep grooves are gnawed round the trunks of the trees. Chip by chip the wood is ripped out by means of the chisel-like teeth. The work goes on until at last with a tremble, then a lurch, the tree crashes to the ground. Then again must the gnawing go on. Branches and twigs are removed, the trunks are cut into the desired lengths, and the logs are then dragged to the water. Logs, stones, twigs, and earth are then cunningly fashioned into a substantial dam—nearly straight across, if the stream flows gently, but in a curve facing upstream, if the stream is rapid, so that the structure will withstand the current. Both lodge and dam are masterpieces of animal skill. Some authorities claim that beavers are so intelligent that they always fell their trees toward the water, so they will not have to drag them far, but this is not the belief of most naturalists. It is not uncommon to find trees two feet in diameter which have been cut down by beavers.

When the homes have been made and carefully protected, the beavers spend a care-free summer living on twigs, bark, and the roots of water plants. With the approach of autumn, once again they busy themselves repairing their dams, if necessary, and gathering their winter store of willow, poplar, birch, and alder bark. For, when the pond is frozen over in winter, they cannot go to the land, and must live on their store of food and on roots which they dig from the water. The breeding season of beavers commences in spring—in April or May. Two to four young ones appear at a birth, and they remain with their parents two years. In the third year, they venture forth, find mates, and start new generations and new colonies.

Among animals, beavers hold the same position that the bees and ants have among insects, in their remarkable instinct of working in common; and to say that a person is "as busy as a beaver" is as much a compliment as it is to say one is "as busy as a bee." Even though the beaver may live in a cage, its community instincts are demonstrated. It will cut to pieces a box or a chair and build a dam for the stream that will never flow, or weave sticks between the bars of its cage. The animals become used to confinement, and colonies are flourishing in many zoological gardens.

Commercial Uses. The thick, warm undercoat of beavers is one of the most valuable

Outline and Questions on the Beaver

I. Characteristics

- (1) Of muskrat family
- (2) Size, weight, shape, and color
- (3) Tail
- (4) Appearance of head
- (5) Fur
- (6) Teeth

II. Life and Habits

- (1) Haunts
- (2) Social nature
- (3) Lodges and dams
 - (a) Materials
 - (b) Method of construction
- (4) Food
- (5) Industry and intelligence

III. Commercial Value

- (1) Fur
 - (a) Danger of extermination of beaver
 - (b) Importance of fur-hunting in history
- (2) Use as food among Indians
- (3) Use in manufacture of perfume

Questions

- Of what use is the tail of the beaver?
- How does a beaver cut down a tree?
- What part did this animal play in the early history of North America?
- What famous American author wrote a description of its life and habits?
- To what curious use was the skin formerly put?
- Why does the beaver build a dam?
- With what insects may it be compared, and why?
- What parts of the beaver besides the skin are useful?
- How are the teeth specially fitted for the work they must do?
- How old is the young animal when it sets up housekeeping?
- Why are beavers not usually shot?
- How does the skin of the live animal differ from that seen in a beaver collar?
- How large is the ordinary house or lodge?
- How many rooms has it? How many openings?
- What special adaptation is to be seen in the direction in which a dam is built?
- How would you go about it to catch a beaver?

of furs. It was at one time extensively used in the manufacture of hats, and the early prosperity of New York and Canada was based quite largely on beavers. The animals have been driven so far into the wilderness, however, and are so diminished in numbers that beaver fur has become expensive and rare. It is now used chiefly for muffs, collars, coats, and trimmings (see FUR AND FUR TRADE).

One form of beaver trap is a noose fastened to a branch of a tree, so arranged that when a beaver's head is caught in the loop, the branch springs up, the rope tightens, and the animal is caught. As beavers go about chiefly at night, it is not easy to catch them by shooting.

Indians and frontiersmen liked the flesh of beavers. A reddish-brown substance called *castoreum* is obtained from these animals; it has a strong, penetrating odor and is used by perfumers. At one time it was valued for medicinal purposes.

A very fine description of the beaver, its method of living, and also the method of trapping it, may be found in *Astoria*, written by Washington Irving. W.N.H.

Scientific Names. Beavers belong to the family *Castoridae*. Most naturalists consider the American beaver a distinct species, *Castor canadensis*. The Old World beaver is *C. fiber*.

BEAVERETTE, *be v'r et'*, a fur. See RABBIT.
BEAVER FALLS, PA. See PENNSYLVANIA (back of map).

BEAVER LAKE. See SASKATCHEWAN (Surface and Drainage).

BEAVER STATE, a popular name applied to Oregon (which see).

BEBEL, *ba' bel*, FERDINAND AUGUST (1840-1913), after Karl Marx, the greatest of German Socialists. He was the man who made the Social Democrats a great political party in Germany. His extraordinary eloquence made him, even when a young man, a leader among the working classes. He was at first opposed to socialism, but under the influence of Marx and Liebknecht, he became a convert to that social theory. In 1869 he was one of the organizers of the Social-Democratic party.



Photo. Brown Bros

BEBEL

Meanwhile, he had been elected to the North German Diet, and in 1871 was chosen to the Imperial Reichstag. He was repeatedly re-elected, and with the exception of two years, he was a member until his death. He was the first Socialist elected to the Reichstag, and for a time was the only Socialist member. Although the rules of the party do not recognize a leader, Bebel was for years its unquestioned chief. He never hesitated to express his opinions freely and forcibly. Three years of his life were spent in prison, because some of these opinions were held by the courts to constitute insult to the emperor and intended treason. See MARX, KARL; SOCIALISM.

BECHUANALAND PROTECTORATE, *belch oo ah' nah land*, a territory 275,000 square miles in extent, with a population of about 160,000, of whom only 2,000 are whites. The protectorate is located north of the Union of South Africa and east of Southwest Africa. It is not to be confused with Bechuanaland, though the two were once under the same administration; the latter now forms a part of the province of the Cape of Good Hope, in the Union of South Africa.

Each local chief rules his small section undisturbed by white authority except for the correction of abuses; the chiefs, however, acknowledge the British as supreme, and the London government is represented by a resident commissioner, who is subject to the High Commissioner for South Africa.

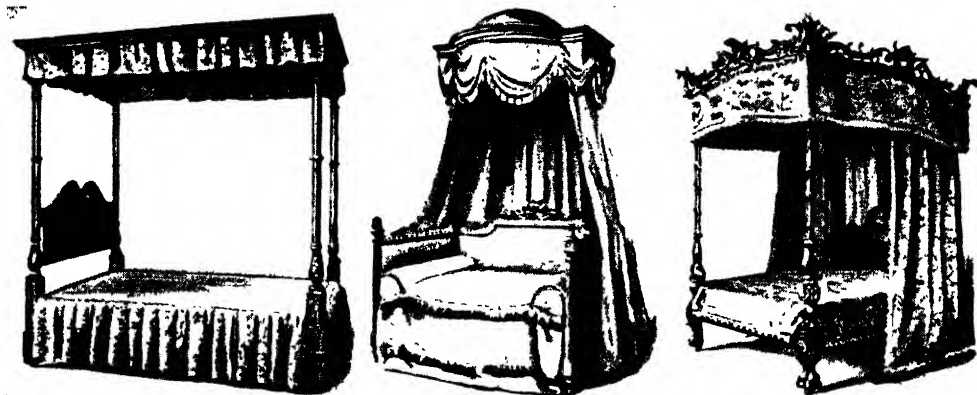
Cattle raising and a limited agriculture are the occupations of the natives. A railroad traverses the eastern part of the protectorate, from the Cape province northward into Rhodesia. See PROTECTORATE; AFRICA (Division into Countries).

BECK, L. ADAMS. See CANADIAN LITERATURE (English Canada).

BECKET, THOMAS A. (about 1118-1170), an archbishop of Canterbury, famous for the manner of his death and its effects on English history, no less than for the achievements of his life. He was born in London, was educated at Oxford and Paris, and studied civil law at Bologna, in Italy. Returning to London, he held various offices in the Church before his appointment by Henry II in 1155 as chancellor of England. At this time, Becket lived in a luxurious manner; he was a liberal entertainer and the king's favorite companion, but after he was consecrated archbishop in 1162, he gave up his expensive habits and became a zealous champion of the Church, generous only in charities.

A series of bitter conflicts with the king followed, ending in Becket's flight into France, but a reconciliation took place in 1170, and Becket returned to England, resumed his office, and renewed his opposition to the royal authority. At length, the king, irritated at some new defiance, exclaimed in the hearing of his knights, "Have I not about me one man of enough spirit to rid me of a single insolent prelate?" Four of his barons, taking this as their commission, went to Canterbury and murdered the archbishop while he was at vespers in the cathedral, December 29, 1170. He was canonized in 1172, and the splendid shrine erected at Canterbury for his remains was long a favorite place of pilgrimage. Chaucer's *Canterbury Tales* are told by a number of people who were making a pilgrimage to this shrine. See CANTERBURY TALES.

BECKY SHARP, the chief character in Thackeray's *Vanity Fair*, one of the most con-



DREAMS WERE NO SWEETER BECAUSE OF THESE

At left: bed in home of well-to-do American in the Revolutionary period. In center: French carved and gilt bedstead, period of Louis XVI. At right: a Chippendale bed (see FURNITURE)

vincing, clearly portrayed adventuresses in all fiction. As the personification of intellect without heart, she is set over against Amelia Sedley, the other heroine of this "novel without a hero," who represents heart without intellect. Becky is portrayed as not beautiful, but so clever and so unscrupulous that few can escape her net. Having married Rawdon Crawley, whom she does not love, merely because she wants an assured position in the world, she risks and loses that position and her own reputation in her efforts to entangle the wealthy Marquis of Steyne. At the close of the long story, she has lost her friends, but she has not changed her methods, and the reader feels that she will find no difficulty in snaring another dupe.

BECQUEREL, *bek rel'*, **RAYS**. See RADIO-ACTIVITY.

BED, in a general sense, the place where one sleeps. The term may include the heap of leaves or animal skin on which the savage lies, the fur bag that serves as a bed for the Eskimo, or the rug or mattress used by the Oriental. Japanese people go to rest on a strip of matting, with a wooden head rest which closely fits the neck. Much more elaborate are the beds of Europeans, Canadians, and Americans, who demand the comforts of springs, mattress, linen sheets, pillows, and quilts, all of these being placed on a frame known as the bedstead.

The bedsteads most pleasing to modern taste are made of wood; walnut, mahogany, oak, and bird's-eye maple are the favorite materials. Iron beds, enameled in white or colors, and steel frames painted in imitation of wood, are also in use.

The desire to save space has played an important part in changing the styles of beds. The old-fashioned folding bed, which resembles a wardrobe when folded up, has numerous

modern successors in pieces of furniture that are slept in at night and become in the daytime library tables, bookcases, chests, etc. The sanitary couch and davenport lounge are also found convenient, as they can be used in the daytime as an ordinary couch. Probably the most remarkable bed that owes its origin to the desire to save space is the so-called *disappearing bed*, which folds on hinges and slides into a recess in the wall and is kept there when not in use. Some apartments are provided with disappearing beds, and have no separate bed chambers.

The Beds of the Ancients. Among the ancient Orientals there was slight difference between the bed and the couch on which they reclined during the day. The Babylonian and Assyrian monarchs rested on magnificent beds of ivory, gold, and choice woods, and in the writings of Herodotus, the "Father of History," mention is made of Persian beds adorned with gold and silver, and covered with rare and costly fabrics. That the Israelitish kings likewise had luxurious tastes in this respect is indicated by a passage in *Proverbs* VII, 16: "I have decked my bed with coverings of tapestry, with carved works, with fine linen of Egypt."

The Grecian love of the artistic was reflected in the construction of their bedsteads, the posts of which were usually graceful in design and crowned with the Ionic capital (see COLUMN). These bedsteads were narrow, and only the headboard was raised above the bed. They were generally of wood, but marble or terra cotta was sometimes used. Excavations in the ruins of Pompeii, destroyed by the eruption of Mount Vesuvius in A.D. 79, show that the Romans slept upon beds much like the modern wooden bedsteads in structure and proportions. Bedsteads of bronze, silver, and gold have been taken from the ruins; a large num-

ber of those excavated are adorned with precious woods, ivory, tortoise-shell, gold, and silver. Some of the frames were so high that they could be reached only by means of footstools. The rich used a mattress stuffed with wool or feathers; the poor had to be content with straw or dried reeds.

Medieval and Later European Beds. After the fall of the Western Roman Empire, a certain degree of simplicity prevailed in the house furnishings of Europeans, but the Crusaders took back with them from Asia Minor some of the luxurious tastes of the East, and in the twelfth-century beds ornamented with carvings and paintings were introduced. Many of these had richly embroidered coverings, with canopies overhead. The beds of the French kings of the fifteenth century were famous for their size and richness, and it became customary for monarchs to hold royal receptions in bed. In the sixteenth century, the French royal bed attained a splendor never before equaled; the superb collection of Louis XIV, consisting of 413 bedsteads of all forms, was the wonder of all who saw it.

In the sixteenth century, the historic "four-poster," commonly used in America in colonial days, was invented. This is a bed with four tall posts, one at each corner, which support an overhead canopy. The "four-poster" periodically returns to favor, but without the use of the canopy. Oak became popular in England during the Elizabethan period as a bedroom wood; walnut was in vogue at about the same time in Italy and France.

BED (in geology). The building up of most stratified rocks was not a continuously uniform process, but varied from time to time or may have ceased briefly and then begun again, perhaps repeatedly. Such changes have been due to changes in the kind, or the rate of supply, of the material forming the deposit, or in other conditions that affected its formation. Sometimes the changes were gradual; at other times they were abrupt. As a result, the rock is not a continuous mass of uniform character, but is a series of layers. Each layer, which may be of any thickness from a fraction of an inch to several feet, is a *bed*, or *stratum*, and the structure displayed by such rocks is *bedding*, or *stratification*; hence, stratified rocks are sometimes called *bedded* rocks. Each bed may differ from the next in coarseness, color, mineral composition, or some other feature, or the beds may be closely alike in these respects; but each is separated from the next by a distinct surface, called a *bedding plane*. Some sedimentary rocks lack bedding planes, and show little evidence of stratification. Such rocks are said to be *massive*.

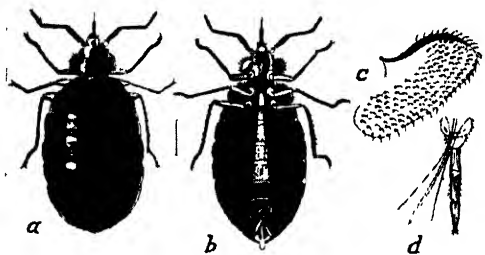
In some stratified rocks, especially fine-grained ones, each bed is made up of thinner, less distinct layers, called *laminae*. This

structure is *lamination*. In some rocks deposited by strong currents, laminae in each bed are inclined to the bedding planes. Such a structure is known as *diagonal lamination*, or *cross-bedding*, and the rocks are said to be *cross-bedded*.

In *mechanics*, a bed is the foundation upon which a body rests. An example of this is the bed-sill upon which a stationary engine is fastened; also the lower mill stone in a grist mill. See GEOLOGY. L.LaF.

BEDBUG, a small, flat, wingless, reddish-brown insect, about three-sixteenths of an inch long, that hides in the daytime and comes out at night for food. The female lays her eggs in summer in the crevices of bedsteads, furniture, and the walls of a room. The younger insects are small, almost white, and semi-transparent; they grow to full size in about eleven weeks. The bedbug is fond of human blood, but thrives on blood of other animals, and is often found on rats, mice, poultry, and birds. When touched, it emits an unpleasant odor.

The occasional presence of bedbugs in a house is not necessarily an evidence of careless housekeeping. They may enter a home in many ways—on clothing, by way of steam pipes from adjoining apartments, in trunks or boxes from other dwellings, etc. Unless



ADULT FEMALE BEDBUG

(a) upper view, (b) lower view, (c) rudimentary wing pad; (d) mouth parts

one lives in a large tenement building, however, where many of the neighbors are slovenly, there is no necessity of suffering long from the pests. Spraying cracks and crevices with gasoline or corrosive-sublimate solution will rid a house of bedbugs, but precautions should be taken in using these chemicals, as one is an explosive and the other a dangerous poison. Fumigation with hydrocyanic-acid gas will destroy any and all vermin; here again, the poisonous character of the chemical calls for caution. Fumigation may be accomplished by the use of calcium cyanide, which is now available. When spread on the floor, it absorbs water and gradually gives off the deadly gas. W.J.S.

Classification. Bedbugs belong to the family *Acanthiidae* and the order *Hemiptera* (which see)

BEDE, *beed*, OR **BAEDA**, *be' da* (about 672-735), known as **THE VENERABLE BEDE**, the greatest scholar of Saxon England and the "Father of English History." He was educated at Saint Peter's monastery, Wearmouth, then took deacon's orders, in his nineteenth year, at Saint Paul's monastery, Jarrow, and was ordained a priest at the age of thirty. His



Photo Visual Education Service

IN DURHAM CATHEDRAL

In this chapel is the tomb of The Venerable Bede.

Ecclesiastical History of England is the source of nearly all our information on English history up to the year 731; it was translated into Anglo-Saxon by Alfred the Great. The great body of his writings, consisting of thirty-seven titles, includes lives of the saints, hymns, works on grammar and history, and comments on the Bible. The Venerable Bede died while engaged in dictating a translation of the *Gospel of Saint John*.

BEDFORD, IND. See **INDIANA** (back of map).

BEDLAM, a word used in modern speech in the sense of wild uproar or confusion. It has an interesting derivation, being a corrupted form for *Bethlehem*, a name formerly applied to an old hospital for lunatics, in Southwark, London. The full name of this institution was Hospital of Saint Mary of Bethlehem. In olden days, the patients of this hospital were exhibited like so many wild beasts, the public paying to see them; the less violent inmates were compelled to wander about the streets as beggars. The present hospital of the same name is a modern institution.

BEDLOE'S ISLAND, since the World War patriotically referred to as Liberty Island, is an island in New York Bay, on which stands the famous *Statue of Liberty* (see **LIBERTY, STATUE OF**). Bedloe's, named for a former owner, covers thirteen and one-half acres, and lies one and one-half miles southwest of the Battery. It belongs to the United States government, and was formerly occupied by Fort Wood. Close to Bedloe's Island is Ellis Island, the immigrant station.

BEDOUINS, *bed' oo inz*, the name for *people of the tent*. They are Mohammedans of the

Arab race, descendants of the people of North Arabia, who claim Ishmael as their ancestor. They now inhabit chiefly the deserts of Arabia, Syria, Egypt, and North Africa. They are patient and enduring, and they lead a wandering existence, associating in families under "elders," or "sheiks," or in tribes under "emirs." They are regularly shepherds, herdsmen, and horse-breeders, but because of prolonged summer droughts, they raid one another for self-support, and plunder unprotected travelers, whom they consider trespassers. They are ignorant of writing and books, but they have good memories and vivid imaginations, which find play



Photos U & U, ORO C

A FINE BEDOUIN TYPE

Below is a Bedouin home on the edge of the Sahara. Camel hair cloth serves as a roof, and a good wind-break is provided by cornstalks stuck into the sand.

in their song and story. They are undersized, and though active, are not strong, and they live chiefly on rice, vegetables, honey, locusts, or even lizards at times. The ordinary dress of the men is a long shirt, girt at the loins, a black or red and yellow turban for the head, and sandals. The women wear loose trousers, a long shirt, and a large dark-blue shawl covering the head and figure. See **ARABIA**; **NOMAD LIFE**; **SAHARA**. C.W.



BEE. Almost anyone hearing the word *bee* thinks instantly of just two species—the honeybee, Isaac Watts' "little busy bee" that "improves each shining hour," or Emerson's "burly, dozing bumblebee," the "animated torrid zone." For these two are most commonly seen and heard in the gardens and clover fields in summer, and it is the former that supplies man with one of his most popular luxuries. But these two species comprise a very small part of the great group of insects known as bees—a group which ranks as the highest of the insects (unless the ants are thus considered), and which is as interesting as any of the forms of higher life. Authorities declare that there are about 5,000 species of bees, some of them small and insignificant, some so like flies or wasps that they are almost unrecognizable; but all are possessed of an intelligence and an ingenuity that seems incredible in such small creatures. Most of these kinds of bees live a solitary and not a social life like that of honeybees and bumblebees. Much that is told of bees sounds like the merest "nature-faking," but it has back of it real knowledge, based on generations of study. Care must always be taken, however, as in the study of any form of animal life, not to impute the motives and reasoning powers of human beings to these creatures of lower order. Much that seems like the result of calculated intelligence is in reality inherited and unreasoning instinct.

Distinguishing Characteristics. With the ants and wasps, bees belong to the great order of membrane-winged insects known to scientists as the *Hymenoptera*. Each member of this order—unless it be of the wingless species, like some of the ants—has four wings; and a bee by this fact may be infallibly distinguished from any of the two-winged flies. Bees themselves differ from all other membrane-winged insects by having feathery hairs on the head and thorax, thickened hind feet, and mouth parts so modified that nectar may be gathered from flowers. It is this last characteristic which has given rise to the division of all bees into two groups—the short-tongued bees, which can find their food only in the shallow, open flowers, and the long-tongued bees, which can penetrate to the bottom of the deepest tubular blossoms. There are also other interesting adaptations of organs to special use. In some bees, those that

burrow into the ground or into wood, the jaws have grown into sharp digging tools, while in others the jaws form a sort of spoon wherewith wax may be molded.

The eyes of bees are large and compound—that is, made up of hundreds and hundreds of little eyes; and it is probable that no other insect has better sight. The wonderful ability to return to the home spot from a far-distant place, exercised so unswervingly that "a bee line" has become proverbial for the shortest distance between two points, seems to depend not so much on a sense of direction, as in birds, but on a keen sense of sight. It seems possible that bees can distinguish colors, too, as they seem to show a preference for certain colored flowers. Their antennae, which they use as "feelers" and as a means of communicating with each other, are probably their organ of smell as well, but just where their "ears" or hearing organs are located cannot be determined. That they can hear seems certain, however.

What Bees Eat. A bee will feed upon moistened sugar if it can get nothing else, but it prefers the dainty, perfumed nectar of flowers, certain bees showing an especial liking for certain flowers. And when bees want the honey from flowers, they are very determined in their efforts to get it. If a flower is too narrow to permit them entrance, they use their strong cutting jaws to open a way for themselves. Nor is honey the only thing bees take from flowers. The young, or larvae, which are not little bees, but are merely tiny grubs, are not fed on honey, but on "bee bread," which is the pollen the flower-visiting bees carry home on their thighs. This they roll into a compact little mass and press down into the cells where the young are kept.

For all that the flowers do for them, the bees pay well by one very important service which they perform. Many a flower would never come to maturity—never yield seed from which its kind may be reproduced—did not the bees visit it. As the bee pushes down into the blossom to find the nectar always hidden in the deepest corner, it brushes off on its hairy legs the pollen, that insignificant, red or brown or yellow dust which is more important than all the gaily colored petals; and on entering another flower it shakes off a part of this on the pistil, thus fertilizing the flower (see CROSS-



Photo U & U

DOMESTIC BEES OBTAINING NECTAR FROM WHITE CLOVER BLOSSOMS

POLLINATION). If the bee buzzed into all flowers, helter-skelter,—a rose, a four-o'clock, a nasturtium—it could not fulfill this important mission, for a rose cannot be fertilized with pollen from a pansy, nor a lily with that from a morning-glory. But a bee is a systematic worker, visiting in succession all the flowers of one kind which it can find before it passes on to another kind.

Very wonderful, indeed, is the study of flowers in their relation to bees and other insects; it brings the realization that not only the nectar but the beautifully shaped and tinted petals have been developed just to attract the pollen-carriers. Certain flowers, such as the snapdragon, cannot be fertilized by flies, and are therefore so made that a fly cannot enter them and steal their honey without doing them any service. The curiously shaped petals are closed until the heavy bumblebee alights on the ledge, or "lip," when its weight opens up the blossom and lets it slip in.

Kinds of Bees. The commonest and most serviceable classification of bees is not made along structural lines, but according to their methods of life, and with this as a basis they are divided into two groups—the *solitary* bees and the *social* bees. In the former class, each family lives by itself, and does its own work; and though often several families build their homes or nests close together, there is no community life or specialization in labor. In these solitary bee families, there are, as in most other insects and all higher forms of life, but two kinds of individuals—male and female. Best known and most interesting of the solitary families are the carpenter bees, large and small, and the mason bees. (See *Carpenter Bee*; *Mason Bee*, in subtitle below.)

The social bees, which stand at the very summit of bee life and often appear to have real intelligence rather than mere instinct, live in communities, governed by strict laws and conducted with the greatest orderliness.

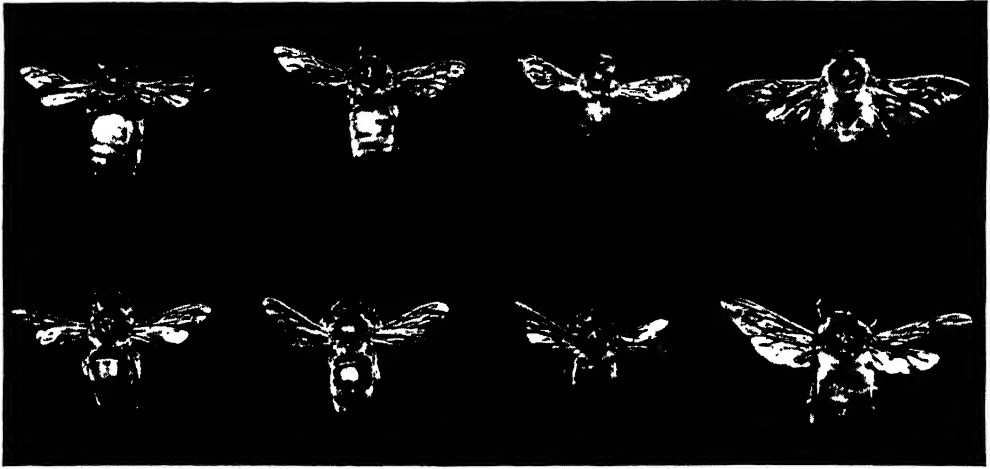
Social bees alone have the power of secreting wax; the solitary bees make their nests by boring into the ground or into wood and walling off cells with mud or cut-up leaves. Of the social bees, there are but two families, the bumblebee and the honeybee, each of which is described below

The Honeybee

This is the only insect which makes any contribution to the food of man. It is the most highly developed and intelligent of the insects, and none other except the ant can compare with it in its wonderful community life. The ant has, apparently, all the rules and regulations necessary to maintain a well-ordered social life, but it does not build so elaborate a home, nor store its food so systematically.

The well-known hive bee is not native to North America, but was brought from Europe by the early colonists. In the eastern hemisphere it has been known and appreciated for thousands of years. The fourteenth chapter of the book of *Judges* tells of the finding by Samson of a "swarm of bees and honey in the carcass of a lion," and of the fantastic riddle which he evolved out of the circumstance; the classic literature of Greece and Rome has numerous references to honey. In those early days sugar was unknown, the honey furnished by the bees took its place. What its importance was among ancient peoples may be seen from the frequent use of the expression, "a land flowing with milk and honey," to describe a fertile and attractive country.

But if bees are not native to America, and were brought hither from Europe, how are the wild honeybees, which fasten their combs to overhanging rocks and to limbs of trees, to be accounted for? These, it has been determined positively, are not native species, but "reverted" swarms, descendants from some which escaped long ago from their man-made hives.



BEES CLASSIFIED

Photo U & U

From left to right: Italian virgin queen, laying queen, worker, drone, American virgin, laying queen, worker, drone

[For physical features and modes of life which are common to all bees, see the beginning of this article; also, *Bumblebee* and *Solitary Bees*, including *Carpenter Bee* and *Mason Bee*, following this section.]

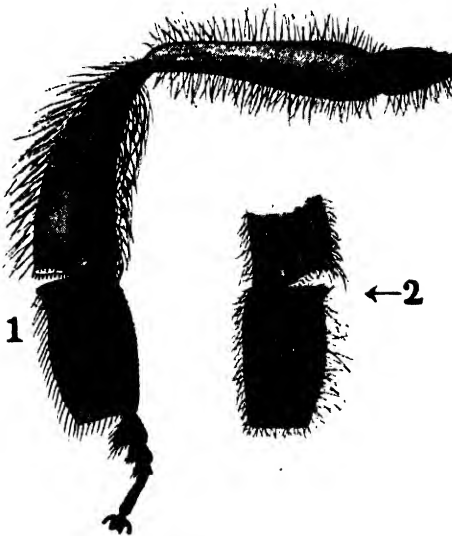
Forms of Honeybees. The honeybees, like the bumblebees, which with them make up the so-called social group, as distinguished from the solitary bees, consist not merely of males

tures, about three-fourths inch in length, have some of the most curious modifications of structure to fit them for their work that are to be found in all the insect world. For one thing, each worker has a curious honey bag, which corresponds to a bird's crop, in which the nectar is stored from the time it is taken from the flower until the bee reaches the hive. There it is forced out and placed in the cells, or "combs," but in the meantime something has happened to change its flavor, for honey has a distinctive taste, different from that of the flower nectar (see HONEY).

The worker has on its hind legs pollen baskets, into which it thrusts the pollen taken from the blossoms; it then transports it to the hive. Another remarkable feature consists of the glands for the secretion of wax and the wax plates on which it is spread out and hardened. The worker has a straight, needlelike sting.

The males are larger than the workers, and their bodies are more hairy. Their eyes are many times as large, and their wings are much stronger; but they have none of the special structures by which the workers are fitted for their tasks, for the males do not work. Because of the characteristic deep buzzing sound which they make as they fly, they are commonly known as *drones*, and this has come to be a term of reproach applied to any one who is not willing to do his share of work in the world.

Longer than the workers or the males, but slimmer than the latter, is the perfect female, or *queen*. This royal name applied to her is likely to give rise to the idea that the queen is the ruler of the bees, but such is not the case. She is the egg-laying female, and because the swarms could not increase without her, she is carefully looked after by the workers. Since

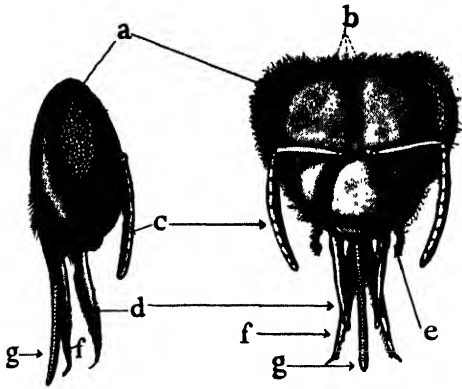


POLLEN CARRYING

Hind leg of honeybee: (1) outer view; (2) inner view.

and females. They include a third form as well, known as *neuters*, or workers. Most numerous and smallest are the workers, which are but undeveloped females. These little crea-

each hive needs but one queen, a second one that develops must either find a home elsewhere, be stung to death by the old queen, or be suffocated by the workers. The queens, like the males, have no pollen baskets or wax



HEAD OF BEE. SIDE AND FRONT VIEWS

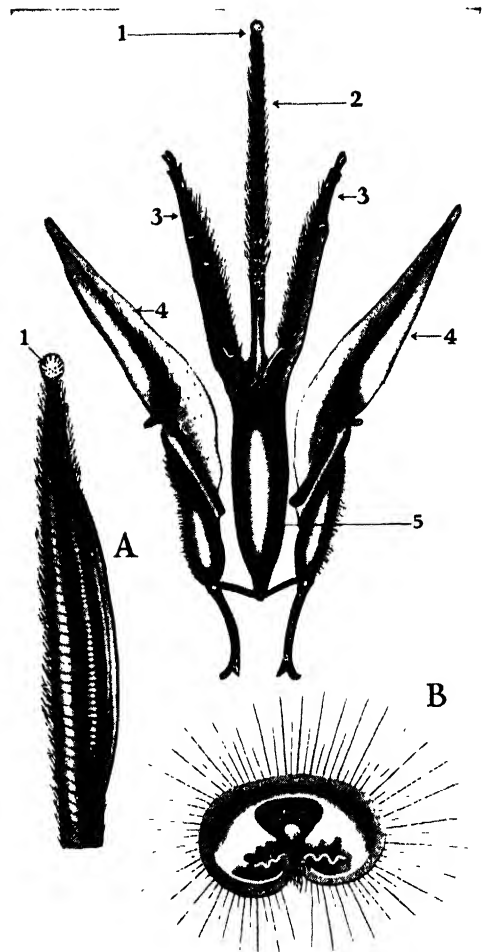
(a) compound eye, (b) three simple eyes (ocelli), arranged in triangle at top of head, (c) antennae, (d) maxilla, (e) mandible; (f) labial palpi, (g) ligula, or tongue (in another illustration is shown an enlarged picture of this member)

pockets, but unlike the males, they have stings, which are curved, and not straight like those of the workers. Since the queen does not wander from the hive, it is not her sting, but that of the worker, with which many a stroller in country places has been made unpleasantly familiar.

The queen, it is believed by some authorities, never uses her sting except against a rival queen in the same hive, but the workers with their stings protect themselves and the honey stores which they are carrying home against other insects and against birds. The wound is very painful, owing in part to the backward-pointing stiff hairs on the sting, in part to the poison which is injected; a sufficiently great number of bees can actually sting to death a large animal. Kipling, in his *Jungle Book*, tells how the united efforts of the "bee people" turned back the dingoes, or wild dogs, which were sweeping over the jungle.

Life in the Hive. Honeybees live in large colonies or societies, known as *swarms*, which consist of from 10,000 to 60,000 individuals. In all this number, there is but one full-grown queen, while the males may number several hundred, but with the coming on of the winter season, the males are all stung to death by the workers, who make up the great mass of the swarm.

Construction of Comb. Well ordered, indeed, is the life of the community. No bee ever tries to assume the rights and duties of another; no



MOULH PARTS OF HONEYBEE

(1) "button", (2) ligula (tongue), (3) labial palpi, (4) maxilla, (5) mentum (chin). (A) detail view of tongue, showing sheath, (B) cross section of tongue, showing its tubular character

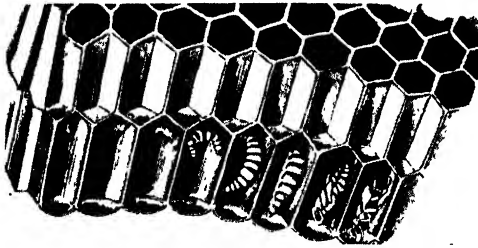
bee, apparently, ever tries to escape its own duties. Just what part each has to play may be seen best by a survey of the activities of a swarm which has just found its home in a new hive. It is a clean, empty place, containing nothing but wooden frames on which comb may be built. This comb is the very first requisite in the new home. Accordingly, a group of workers, or several groups, if the swarm is large,



BEGINNING OF THE COMB

withdraw to a corner and form a hanging cluster, each bee holding to those above it by its hooklike feet. At once they begin to secrete a liquid wax, which hardens in scales on the wax plates of their abdomens and is carried off by other workers to be built into six-sided cells. Nothing about the work of bees is more wonderful than the shaping of these cells. Mathematicians declare that the greatest ingenuity could not work out a method of placing and shaping these which would more effectually combine economy of space and material with the necessary strength.

Egg-Laying. When a number of cells have been made, the queen begins to lay eggs, and her method is most systematic. From cell to



DEVELOPMENT OF A HONEYCOMB

cell she goes, pokes in her head to make sure that a cell is empty and ready, and then glues an egg fast to the bottom. Not every cell is filled, for some are needed for the storing of honey and pollen. The queen possesses one unfailing instinct. There are two sorts of cells, regular-sized ones for the eggs which are to hatch into workers, and larger cells for those which are to develop into drones. Never does the queen mistake and drop the wrong egg into a cell.

The life of a queen is generally three or four years, and during all that time she is laying eggs, for she is the mother of every bee in the hive; as the other classes do not live as long as she does, there must be a constant supply of young bees coming into existence to take the places of the failing ones. Drones live through a whole season, but the tireless workers last only about six weeks. When they weaken and drop, no sympathy is shown them; they are hustled out of the hive and left to die, for the bees are perfect communists and consider the individual of no value. But the queen, while she must labor hard to keep up the population of her colony, is too wise to produce workers always at the same rate. In the summer, when honey is plentiful and many are needed to care for it, she works very fast, laying sometimes as many as 3,000 eggs in a day, but in winter, when the food supply is running low, she produces comparatively few. Usually no eggs are deposited in early winter; egg-laying begins about February 15.

All the time that she is journeying about the hive depositing her eggs, she is accompanied by eight or ten workers, her "ladies in waiting," who surround her in a circle, each one with its head toward her. Evidently, hive etiquette, like that of a court, does not permit the turning of one's back toward the queen. Some authorities hold that it is not the queen who is so wise about laying drone eggs and worker eggs, each in their proper cells, and about regulating the population, but that her special body-guard of workers continually directs all her actions.

Other Industries of the Hive. Bees have been kept for so long that close observation of them has been possible, and most of their activities are fairly well known. Nothing, it seems, is neglected in their wonderful community, where no one bee has any more authority than any other, but it seems impossible to discover whether certain companies are delegated to attend to certain duties, or whether all share alike. There is, as stated above, honeycomb to make and honey and pollen to gather. "Bee gum," technically known as *propolis*, a sticky substance with which they strengthen cells and patch up holes, must also be brought in, and honey-filled cells must be sealed up. Then, too, the hive must be kept clean, and a number of bees are always actively engaged in carrying out broken wax, dead bees, and refuse of all sorts, while others stand at the door as guards and touch with their antennae, or feelers, every bee which tries to enter, to make certain that it really belongs to the swarm. Only bees with the hive odor are permitted to enter. Strangest of all, the members of a large squad have as their function the furnishing of air in the hive. They take their stand near the entrance, and with rapidly fanning wings keep the air in motion. This activity not only provides ventilation, but evaporates from the flower nectar in the cells a part of its water content and thickens it into honey.

Development and Care of Young. The most important duty of the workers is the care of the young, for the queen mother pays no attention to them. The oval egg, about one-twelfth of an inch in length, hatches in three days, and at the bottom of the cell there lies a little white grub—the bee in its *larval* state. The wormlike larvae are so helpless that the workers have to force food into their mouths, and the first food that they receive is special "bee jelly," a pre-digested substance forced out from the stomachs of the workers. Later they are given "beebread," a mixture of honey and pollen, but after about five days, when each young bee almost fills its cell as it lies curled up in it, the workers seal up the cell, using not the pure wax with which they cap the honey cells, but a porous mixture of wax and pollen, through which the larvae may obtain air.

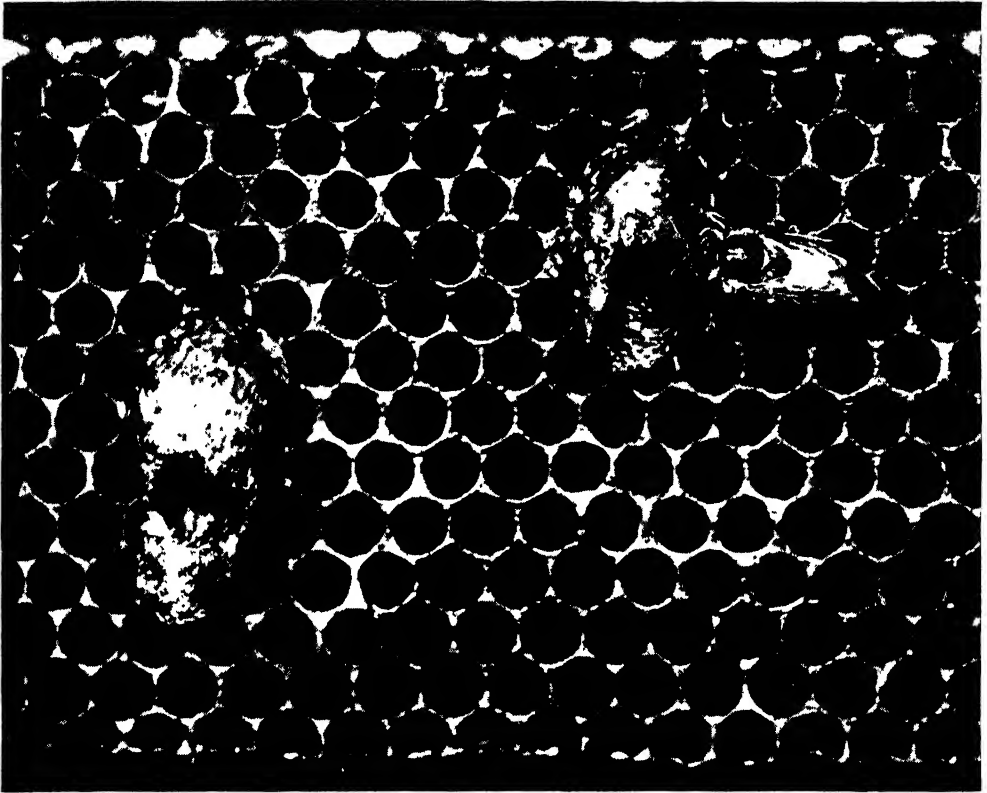


Photo U & U

HOW THE QUEEN BEE MAINTAINS HER SUPREMACY

The first queen to emerge from her cell starts at once to destroy the other queen bees yet in their cells, after which she carries away the remains

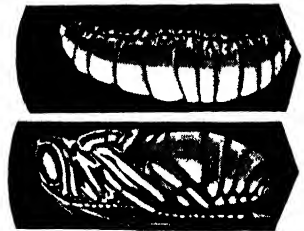
Within the sealed cell, the little larva spins its very fine silky covering and lies dormant for about two weeks; then the young bee, fully developed, gnaws a hole in the cap and crawls out. If the new bee is a male, or drone, it has no tasks to perform, and may, after trying its gauzy wings by short flights, go forth and frolic in the sunshine; but if it is a worker, it speedily learns the meaning of duty. For a time she is a nurse, caring for the undeveloped young; then she learns to make comb, to clean house, and to help ventilate. Finally, after she has been a winged creature for about a week, she makes her first flight, and from that time on helps in the honey-gathering.

Developing New Queens. During the honey flow, the swarm grows all the time because of the constantly emerging young bees, and it begins to be too large for its quarters. The wonderful little creatures know well the way out of the difficulty. First, they must develop a new queen, or, since it is not safe to risk disappointment in such an important matter, several new queens. No special eggs are laid for this purpose, but a special cell must be provided. The walls are torn down between a

cell which already contains a worker egg or a very young larva and several surrounding cells, so that one very large one is formed, quite different in appearance from either worker cells or drone cells. When the larva is ready

to be fed, it is given bee jelly exclusively, and no beebread; the difference in kind and quantity of food is what produces a queen. Seven days after the acorn-shaped cell has been capped, there issues from it a

young bee, a slim, graceful queen. After she has learned her way around the hive, she starts on a tour of inspection with just one object—to discover other queen cells. If she finds such, she breaks them open and stings to death the undeveloped queens within; then the remains are carried away.



Larva (above) and pupa (below) of genus *Apis*, which includes the honeybee.

Swarming. But there still exists the old queen, and rivalry between them is keen. Perhaps they may fight and one or the other of them be killed, and the whole process of queen development has to be gone through once more; but more commonly the bees *swarm*, as it is technically called, before the new queen emerges from the queen cell. All the hive is in vast excitement. Few workers go forth for honey or perform their other duties, and a constant buzzing is to be heard. Then on a bright, warm day one of the queens, usually the old one, issues from the hive, followed by a part, sometimes more than half, of the swarm, and after a short flight settles on some object, frequently the limb of a tree. Scouts are sent out to find a new dwelling place, and the bee-keeper may lose his swarm unless he has ready at hand a new hive which they can be induced to enter. Here they set up housekeeping with precisely the same methods as in the old hive.

Meanwhile, the new queen, having surveyed her domain, issues for a flight, but the workers know that she will return, and do not follow her. Very high into the clear air she flies, and the males, who are hovering over the fields, see her and follow, but so lofty is her flight that only the strongest can keep up with her. The mating takes place high in the air; the drone dies within a few minutes, and the queen comes back to the hive, never to leave it again except for swarming. As many as three successive swarms may issue from a hive in one season, but a bee-keeper tries to prevent frequent swarming, for new colonies have to spend so much time storing up honey to feed the young that they have little to spare for the gathering of the surplus which makes the bee-keeper's profit. To handle swarming bees successfully is quite an art; the illustration suggests danger, also.

Wintering. The drones, as stated above, are killed at the approach of winter, that they may not need to be fed on the stored-up honey. Not nearly so many eggs are laid, and all the activities of the hive slacken. But bees do not hibernate in the sense of remaining dormant during cold weather, and they must therefore eat, but not nearly so plentifully as during more active seasons. A fairly large bee colony should have at the beginning of the winter from twenty-five to thirty pounds of sealed honey, if it is to remain in good condition until spring.

Bee-Keeping. Brought from Europe centuries ago, bee-culture has made great strides in North America, where millions and millions of pounds of honey are sold annually. The larger proportion of this is produced in the large *apiaries*, as places for the keeping of bees are called, but many people keep a few hives

to provide themselves with a delicious luxury and to have the pleasure of studying the interesting insects. No longer are hives of the old regulation "beehive" shape common; square boxes with removable frames have been found to be far more satisfactory. The lower part of the hive is given up to brood-cells and those in which the bees store honey for their own use, but above is a shallower story, known as the *super*, into which are fitted "section holders," that hold in place the little square boxes or frames in which comb honey is placed on the market. Not until the storage cells in the brood-chamber are filled should the bees be allowed to begin



Photo Visual Education Service

ONLY HIS HEAD IS PROTECTED

This bee-keeper is handling a ten-pound swarm of honeybees

storing honey in the section-boxes. In each of these little squares, at the center of the top as it stands on edge, is placed a small piece of comb as a foundation or suggestion to the bees as to where to start.

Commercial bee-keeping is not a simple matter of placing a hive in a suitable place and a swarm of bees within it. The bee-keeper must learn many things about the habits of the little creatures and the method of handling them. He must know how to prevent the development of queens and the resultant swarming at wrong seasons; how to induce his bees at just the right time to begin storing in the supers, how to protect them from enemies (see below) and from the winter cold. Numerous books have been written to teach the principles of bee-keeping, and an attractive one of the smaller, less technical sort is Anna B. Comstock's *How to Keep Bees*. Nothing but really keeping bees, however, can satisfactorily teach. Hives made almost entirely of glass may be procured, and through the transparent sides the interested observer can watch all the motions of the busy little socialists, tracing a bee, from the time it enters the hive, through all its varied activities. See BEESWAX.

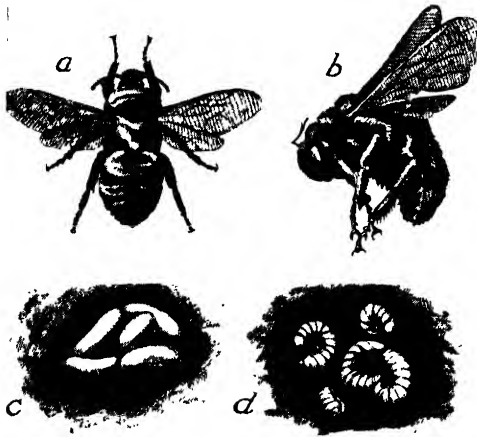
Bee Enemies. In winter, when the bees are torpid, mice sometimes enter the hive and feed upon wax, honey, and bees. Disease is a worse enemy of bees than any animal or insect pest

Two diseases, known as European and American foul brood, affect the larvae, and do millions of dollars worth of damage each year. The only safe method of dealing with American foul brood consists in removing the bees from the infected hive to a new one, and destroying the infected comb and larvae. Introducing a young Italian queen in the place of the old queen is the method used to combat European foul brood.

The Bumblebee, or Humblebee

This is the bee with the deep, loud *br-r-rum-ing* hum. It possesses the most painful sting of all the bees. It is well known in most parts of the world, particularly in temperate regions, and in the northern hemisphere it often reaches the Arctic Circle.

What It Looks Like. The bumblebee looks much like the little honeybee, but is much larger, and its body is thick and very hairy, often colored in bands. Unlike the honeybee, it has two spines on the hind legs. The female bees are larger than the male. The workers sting severely; being wild, and not cared for as



THE BUMBLEBEE

(a) The bumblebee, about natural size, (b) position when about to alight on a flower, (c) eggs, (d) larvae

is the honeybee, bumblebees need this weapon of self-defense, for mice and many larger animals destroy their nests and steal the honey and the brood. Boys, too, who delight in honey plunder, are often stung, in spite of efforts to protect themselves.

Where and How It Lives. Under the ground in deserted nests of mice, in hollow trees, or in openings in rocks, bumblebees live in small colonies of fifty to 200, where half of the bees are workers, or neuters, the rest females and males. They are not so orderly or perfect in their family life as are the honeybees, as may be seen in the roundish, oval, scattered cells of different sizes found in a single nest. Some of these cells are used more than one year.

Bumblebees collect honey and store it in the old cells, and when flowers are plentiful and the stores of honey are large, new cells of wax are built. But at the end of the season, the males and workers die, and only a few females, each destined to be a queen, survive. During



NEST OF THE BUMBLEBEE.

He has none of the aristocratic instincts of his relative, the honeybee

the winter, the queen bee sleeps beneath leaves or moss. In the early spring, she awakens and immediately gathers a store of old honey and pollen, in which she lays eight or ten eggs. Continuing to collect food, she lays eggs for one brood after another. As the eggs hatch, the larvae (young) eat the surrounding food, and grow rapidly. When fully grown, they spin a silken wall about them which the old bees strengthen by a layer of wax, and in these cells the early broods develop into workers. They immediately assist in building cells and gathering honey. Later broods produce females and males, and eggs laid after the last of July produce the large females, or queens. These undergo hibernation during the next winter.

What Is Its Use? The honey of the bumblebee is strong-flavored and not desirable for commercial use, and the sting of this bee is long remembered; many think it justifiable to kill it. But the bumblebee is useful. It aids in the cross-pollination of plants, and is the only insect which can fertilize the clover. Bumblebees were taken to Australia and New Zealand especially for that purpose, for without them clover could not be successfully grown in those countries, and there were no native bees there. This was one of the romances of the insect and agricultural world.

Guest Bumblebee

The Guest Bumblebee. In the nest of the bumblebee will always be found a cell with a very strange guest. It looks like a bumblebee, but it is not one, although a near relative. It lives on the honey gathered by the workers, but does nothing to pay for its keeping. It is merely a parasite, or something which lives wholly through the efforts of other living

OUTLINE AND QUESTIONS ON BEES

Outline

I. Distinguishing Characteristics

- (1) Membrane-winged insect
- (2) Feathery hairs on head and thorax
- (3) Thickened hind feet
- (4) Tongue adapted to gathering nectar
- (5) Senses
 - (a) Sight
 - (b) Touch
 - (c) Smell
 - (d) Hearing

II. What They Eat

- (1) Honey
- (2) Bee bread

III. Cross-Pollination of Plants

- (1) Method
- (2) Systematic visiting of flowers
- (3) Modifications of flower structure

IV. Classification

- (1) Social bees
 - (a) Honeybee
 1. Historical
 2. Classes of individuals
 - (a) Workers
 1. Largest class
 2. Smallest form
 3. Undeveloped female
 4. Performs all work
 - (b) Males
 1. Larger than workers
 2. Hairy body
 3. Performs no tasks
 4. Killed at approach of winter
 - (c) Females or queens
 1. Largest body
 2. Lays all eggs
 3. Have stings
 3. Community life
 - (a) Wax-secreting

- (b) Comb-building
- (c) Egg-laying
 1. How eggs are placed
 2. Number laid
4. Development of young
 - (a) Egg
 1. Size
 2. Shape
 3. Hatches in three days
 - (b) Larva
 1. Grublike
 2. Fed by worker
 - (c) Young bee

5. Development of queen
 - (a) Same egg as worker
 - (b) Difference in food
 - (c) Hostility to other queens

6. Swarming
7. Wintering
8. Bee-keeping
 - (a) Best kind of hive
 1. Brood cells
 2. Supers

9. Enemies of bees
 - (a) Animals
 - (b) Disease

- (b) Bumblebee
 1. Structure
 - (a) Size
 - (b) Color
 - (c) Sting
 2. Community life
 - (a) Ready-made nest
 - (b) Wax in cells
 - (c) Only females live through winter
 - (d) Formation of new colony
 3. Fertilization of flowers
 4. Guest bumblebee
- (2) Solitary bees
 - (a) Carpenter bee
 - (b) Mason bee

Questions

What does the scientific name of the order to which bees belong mean?
 How can bees be told from other insects of this order?
 Where do bees rank among the insects as to intelligence?
 What kind of eyes have bees?
 What is their favorite food?
 On what are the young fed?
 Are bees an injury or a benefit to the flowers they visit?
 What system of visiting have they that has its effect on the flowers?

OUTLINE AND QUESTIONS ON BEES—Continued

Questions

- Into what two great classes are bees divided?
Name the most important solitary bees.
To which class does the honeybee belong? The bumblebee?
What curious difference is there in the number of classes of individuals in the two great groups?
Did the American Indian know anything about honeybees?
What is a neuter?
What is a drone? Why is it given that name?
Which classes of honeybees have stings?
How does the queen compare in size with the workers and drones?
Is she the ruler of the hive?
What is her special function?
How many queens does one swarm have?
Which class of honeybees builds the comb? Which secretes the wax?
How long does a queen bee live? How long does a worker live?
Is there a difference between a worker egg and a drone egg? Between a worker egg and a queen egg?
How many eggs can a queen lay in a day?
How long does it take the eggs to hatch?
How are queens developed?
Why do not the thousands of bees in a hive die for lack of air?
What are the larvae (young) of the honeybees fed on?
How long after the egg is hatched is it before the fully developed bee appears?
Which is the most numerous class of honeybees?
Why do bees swarm?
Will they swarm without a queen?
What happens to honeybees in the winter?
What kind of hive is now considered best for honeybees?
How does it happen that some sections of honeycomb are entirely filled with honey, while others have honey alternating with egg cells?
What are the worst enemies of honeybees?
What does a bumblebee look like?
Can a bumblebee sting?
Is it a wild bee or a domesticated bee?
Where does it make its nest?
Can it secrete wax?
Are bumblebee queens as jealous of each other as are honeybee queens?
What happens to bumblebees in the winter?
Is the honey made by bumblebees good to eat?
Why should bumblebees be introduced into new territory?
What uninvited guest does the bumblebee have?
Why is the carpenter bee given its name?
Describe the way it builds its nest.
Can the mason bee make wax?
Of what does it construct its home?
What striking difference is there between the honeybee workers and the ant workers?
Why can it be said that an ant colony is much more permanent than a bee colony?
How do we know that people have been acquainted with honeybees for a very long time?

things (see PARASITE). But no quarrels are caused by its presence, and some have thought it to be a degenerate type of the true bumblebee. This is not certain, however.

Solitary Bees

Carpenter Bee, a solitary bee as large as the largest bumblebee. Each mother carpenter bee builds her own nest and provides the food for her young. She burrows into wood for a short distance, and then makes a tunnel for a foot or more, lengthwise of the grain. Beginning at the bottom, the bee lays her eggs, each in a separate cell, one above another, and all are filled with a plentiful supply of food. One by one the eggs hatch, and the young remain in their cells and wait; when the last one is hatched, the mother leads her family out for a flight in the sunshine. There are a few kinds of small-sized carpenter bees.

Mason Bee, a pretty little bee which likewise belongs to the "solitaires," or those which live not in communities, but by families. The mason bee either hollows out

a tunnel in pithy wood or makes a nest in some convenient ready-made hole, as a snail shell or a little hollow in the rocks; but in any case she earns her name by her method of constructing egg cells. These she makes of moist clay, in which are embedded little stones, sticks, and leaves, and she works so skilfully that the inside of the cell is perfectly smooth. In each cell is placed one egg and a store of bee bread, honey, and pollen, whereon the grublike young may feed. Though the mouths of the cells are closed by earth, the newly hatched bees appear to have little difficulty in making their way through the difficult obstructions to freedom in the wide world. W.J.S.



HOME OF THE CARPENTER BEE

Classification. Scientists place all species of bees in the superfamily *Apodidae*. This large group is subdivided into fourteen families, of which the most important are the honeybees, *Apidae*, and the bumblebees, *Bombidae*. The other families comprise all of the solitary bees. The scientific name of the common honeybee is *Apis*

melifica. Bumblebees constitute the genus *Bombus*. The carpenter bee is *Ceratina dupla*; the mason bee, genus *Osmia*.

A Booklet on the Bee

There is nothing in all their school work that children enjoy more than the making of illustrated booklets, and when the subject is such a fascinating one as the bee, the pleasure is increased. The following outline is merely suggestive, but will give a good idea of how attractive a booklet may be made. Use two sheets of paper 9x12 inches, or larger, and fold once, making eight pages.

Cover page—Border at top and bottom of six-sided figures, representing cells

Title, *The Honeybee*, made of hexagonal drawings

Design, old-style hive or *skep*, representing industry

Name of school and pupil's name at bottom.

Page two—(Blank).

Page three—Essay, *The Bee*

Illustrations: Worker, queen, drone, larva

Page four—Essay, *The Relation of Bees to Flowers*

(a) What the flower gives the bee.

(b) What the bee gives the flower

Illustrations: apple blossoms, wild rose, clover

Page five—Copy of short poem on the bee

Illustrations: Hive, bee on the wing

Page six—Essay, *Honey*

(a) In the comb

(b) Strained honey

(c) Commercial value

(d) Food value

Illustrations: Section of comb, jars of strained honey

Page seven—An original page to distinguish your booklet.

Page eight—Quotations about the bee
Illustrate

BEE BALM. See BALM.

BEECH, a forest tree, beautiful in summer, because of its spreading symmetrical branches and thin, silky leaves; in autumn, because of the rich gold to which its leaves turn with the



BEECH TREE, FRUIT, AND LEAVES

frost; and in winter, by reason of its smooth, gray trunk and its wealth of shining brown twigs with their polished leaf buds. Europe has one species, and North America has another; the two differ chiefly in size, for while the American beech attains a height of from fifty to seventy-five feet, that of Europe may be 100 or 120 feet. The beech has one advantage over many other trees—its seedlings grow well in dense shade, and are thus able to spring up in sufficient numbers to choke out other trees.

The flowers of the beech are of two kinds. The staminate form round heads and hang downward; the pistillate are upright and appear in double clusters. The fruits are three-sided,

bur-sheathed nuts of a pale chestnut-brown. Beechnuts are very good to eat. In Europe they are much used as food for pigs.

The wood of the beech is hard, close-grained, and tough. It is not only excellent for furniture, tool handles, and farm implements, but is suitable for piles and dams, because it is resistant to water. It is also a good fuel. G.M.S.

Scientific Names. The beech family is *Fagaceae*. The American beech is *Fagus grandifolia*; the European, *F. sylvatica*.

BEECHER, HENRY WARD (1813-1887), one of the most effective and powerful pulpit orators that the United States has produced. He was born in Litchfield, Conn., the third son of Lyman Beecher, also a great preacher, and he was the brother of Harriet Beecher Stowe (which see). As a child, he was diffident and sensitive; he acquired a love for the ocean, and was only prevented from going to sea by his admission to the Church in 1826. He studied theology under his father's instruction in Lane Seminary, for a time was pastor of a Presbyterian church in Lawrenceburg, Ind. (1837-1839), and from 1839 to 1847 he preached in Indianapolis. In 1847 he took charge of Plymouth Church, Brooklyn, where he remained until his death.



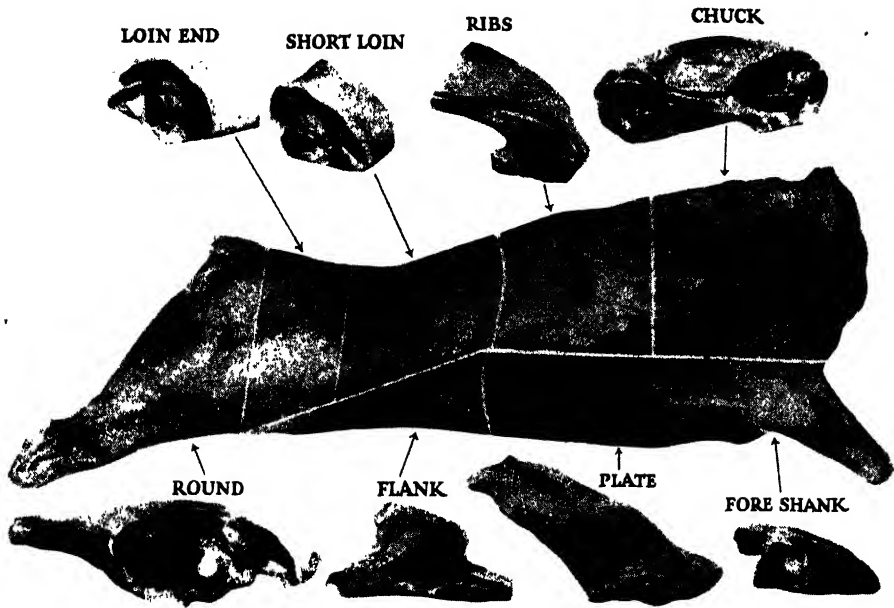
Photo Brown Bros

HENRY WARD BEECHER

Beecher was original in his choice and treatment of subjects for his sermons, and his delivery was eloquent, dramatic, pathetic, and witty. Tender-hearted and charitable himself, any form of injustice called from him bitter denunciations. He was a Republican, and he aided the cause of that party by pen and speech, taking a specially active part in the campaign of 1856. During the War of Secession, he visited England, and there showed his wonderful power over men by controlling clamoring mobs and forcing them to listen to him. He did much to enlist British sympathy for the Northern rather than the Southern cause. During his life in Brooklyn, he wrote for the *Independent*, of which he became editor in 1861; he also edited the *Christian Union* and was a frequent contributor to the *Ledger*.

Among his works are a novel entitled *Norwood*, *Lectures to Young Men*, and *A Circuit of the Continent*.

BEEF, the meat of cattle, is probably the favorite flesh food of man. That it was an important article of man's diet in very early

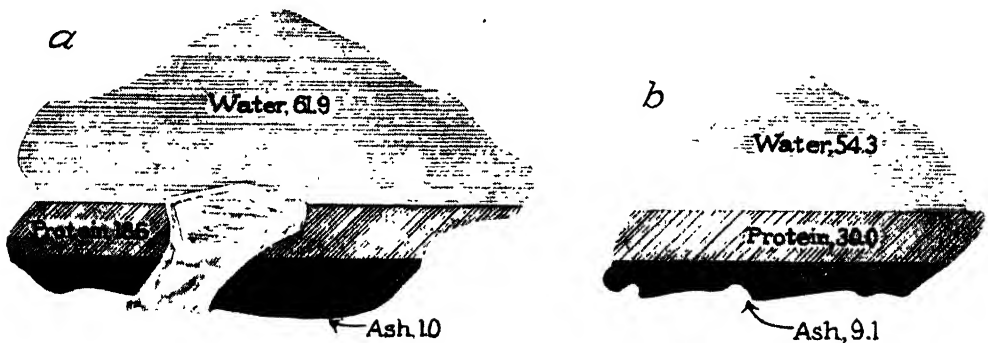


STANDARD CUTS OF BEEF

According to the style established by the great packing houses in Chicago

times we know from the hero-stories in the *Odyssey* and the *Iliad*, and the Bible tells us that it was occasionally eaten even before the days of Abraham. Though it is now a staple food in Canada and the United States and the more prosperous European countries, it is a rare luxury in many other lands. As the great

is killed, and is of course the best. *Dried beef* (or *jerked beef*, as it is called in England) will keep much longer. *Corned beef* is cured by salting. *Canned beef* has become a world-wide commodity; even the United States imports it to meet its domestic needs, and it also exports this form in vast quantities. *Extract*



CROSS SECTION OF A CUT OF BEEF

(a) Fresh beef constituents; (b) the composition of dried beef.

cattle ranges of the world more and more are being converted into grain fields, beef eventually may become too expensive for daily consumption.

Beef is very nourishing, as the lower illustration shows. It is eaten in a number of forms. *Fresh beef* must be consumed soon after it

of beef, if properly made of those elements of the meat which dissolve in hot water, is a stimulant, but is not very nourishing.

Steaks, Roasts, and Other Cuts of Beef. In preparing a carcass, the butcher first dresses it, then splits it along the backbone into halves, and usually into hindquarters and fore-

quarters. The larger part of the illustration shows a half-beef as you might see it hanging in the butcher shop, the lines showing where the butcher will afterward cut it. The various parts are named; where a part is unnamed, it is inferior, suitable for stews, soups, corned beef, etc. E.V.M'C.

Related Subjects. For detailed description of the world's meat industry, see MEAT AND MEAT PACKING See, also, CATTLE; NUTRITION, EXTRACTS; FOOD.

BEELZEBUB, *be el' ze bub*, a word meaning *the god of flies*, is the name by which the Philistines worshipped their chief god. The word was originally written *Baalzebub*, and probably referred to Baal (which see). As used in the New Testament, Beelzebub means the worst of the evil spirits. Jesus said, "And if I by Beelzebub cast out devils, by whom do your children cast them out?" (*Matt. XII, 27.*)

BEE MARTIN. See KINGBIRD.

BEER, a malt liquor used as a beverage. The liquor may be made from nearly all kinds of mealy grains that will ferment, but barley is the one most used. The process of making beer is described in these volumes under the heading BREWING.

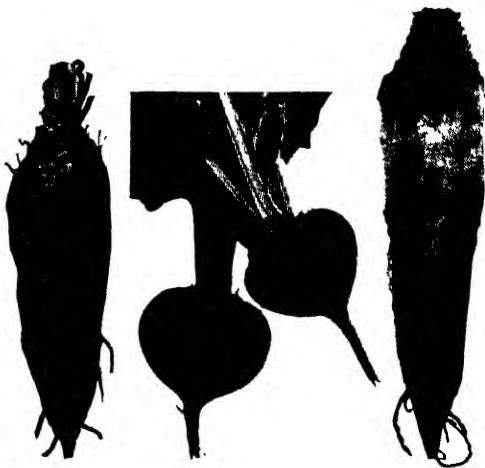
Kinds of Beer. As beer is a name applied to all malt liquors, it includes several different kinds. The one generally used in the United States before prohibition was *lager beer*; this is a light beer which is stored for a time before being used, in order to allow it to ripen and mellow. *Ale* (which see) is a carefully made kind of beer much used in England; it is stronger than lager and lighter in color. *Porter* is a dark, strong English beer, while *stout* is a strong porter.

History of Beer. There is authority for saying that beer was brewed and drunk in very ancient times. The Egyptians must have been familiar with it several thousand years ago, as the process of making it is shown in detail on their wonderful monuments. The Greeks obtained their knowledge of it from the Egyptians, and from them it spread to other peoples along the Mediterranean. When the Romans invaded Britain, about the time of the Christian Era, they found the inhabitants brewing a sort of ale from barley. In the thirteenth century, the Normans had laws regulating its sale. To-day large quantities are drunk all over the civilized world, though in the United States beer may contain only one-half of one per cent of alcohol. Perhaps the people of Germany are the greatest beer drinkers, per capita, in the world. Nearly two billion gallons were consumed in the United States yearly before the adoption of the Eighteenth Amendment.

BEERSHEBA, *be ehr' she bah* (also pronounced with accent on third syllable). See PALESTINE (Cities).

BEESWAX, a solid, fatty substance secreted by bees and obtained from the honeycomb. Before swarming, bees eat honey freely, for it is needed to produce wax for comb-building. For every pound of wax produced, ten to twenty pounds of honey must be consumed. The process by which the wax is prepared for commercial use is not generally understood. The comb is boiled, and the melted wax, rising to the surface, is dipped off. On cooling, it becomes solid. As thus obtained, beeswax is of a dark yellow or brownish color; it contains numerous impurities, which can be removed by melting and filtering. Most of the beeswax placed upon the market is bleached. It is used in small quantities by seamstresses, and by housewives for their flatirons, also in the manufacture of candles, the preparation of ointments and cements, and in modeling. See BEE; WAX.

BEET, one of the few garden vegetables of which the entire plant may be eaten, both roots and leaves. Originally only the leaves were eaten, as "greens," but gradually culti-



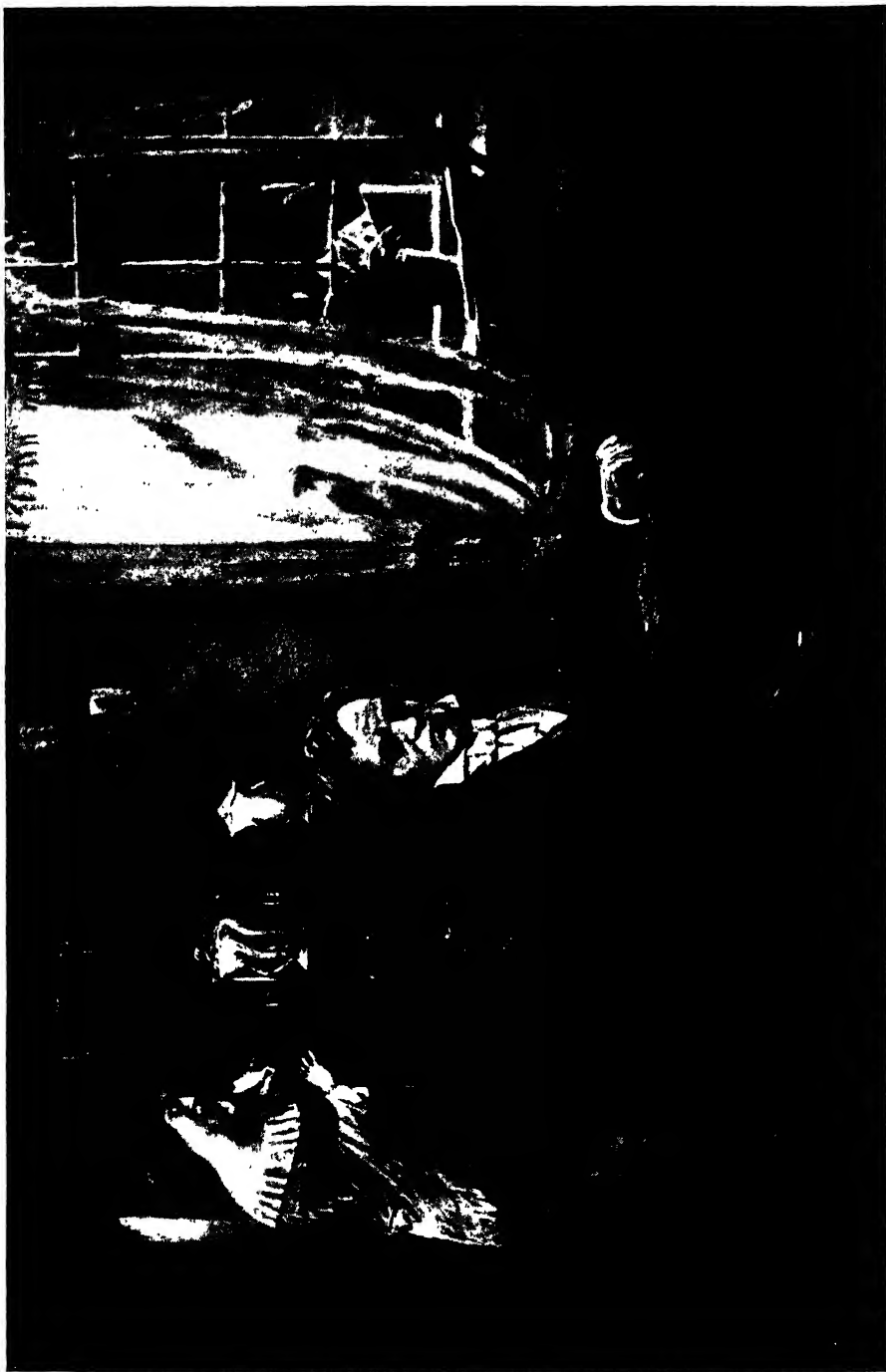
THREE VARIETIES OF BEETS

Sugar beet, common beets, and mangel.

vation increased the size and sweetness of the roots until now it is rather as a root vegetable than as a leaf vegetable that it is grown. The edible parts, usually turnip-shaped, vary in color from white to dark red, the red variety being preferred, and they are prepared for the table by several hours' boiling. They are then served hot, with butter, or are pickled, or used as a salad. About eighty-eight per cent of beet root is water, and ten per cent is carbohydrate, consisting of starch and sugar. Though the nutritive value of beets is not high, their sweet flavor and agreeable succulence make them very palatable, and they give welcome variety to the diet. See CARBOHYDRATES.



From the painting by Roszak, Berlin



From the painting by Koryński, Berlin

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THE PICTURED STORY OF THE "MOONLIGHT SONATA"

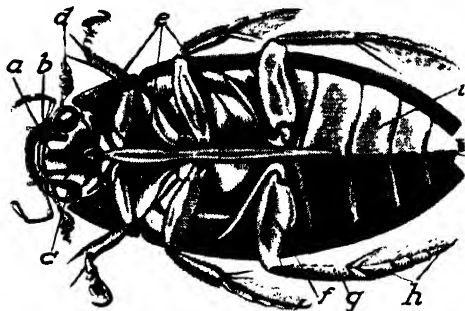
they heard through the open window of a humble dwelling, the lovely strains of the *Sonata in F*. As they stopped to listen, so the story goes, there came a cry of despair, "Oh! If I could but hear some really good musician play this wonderful piece." Entering the cottage, they found the player to be a young blind girl. Beethoven sat down at the old piano and played as if inspired, but the blind girl, who listened with awed delight, knew not that it was the great Beethoven until he struck the opening bars of the *Sonata in F*. Suddenly the candle flickered and went out, and the music ceased. Beethoven's friend stepped to the window and opened the shutters, and as the beautiful moonlight flooded the room the player began to improvise a tender melody that seemed the embodiment of the silvery light that transfigured everything it touched. The great composer then hastened home to put the music into form. He named it the *Sonata in C Sharp Minor*, but lovers of its exquisite melody will always call it the *Moonlight Sonata*. This story has been made the subject of several paintings. One of these is reproduced on page 687.

BEETLE. Few places on the earth are free from beetles, for they live in the water, either salt or fresh, both underground and on the surface of the earth, and as parasites on other animals. They comprise, in fact, the largest of the nineteen orders into which all insects are divided. Scientists have given them the name *Coleoptera*, which means *sheath-wings*, because the distinguishing character of a beetle is the possession of a pair of horny forewings that meet in the middle of the back and hide the membranous hind wings. The hard wings are truly a sheathlike covering for the body. The common name *beetle* means *biter*, and refers to the strong mouth parts, which are well adapted to seizing and chewing the beetle's prey. In respect to the arrangement of their mouth parts, beetles are divided into two large groups, or suborders. One consists of those species in which the head is prolonged into a snout, or beak, and the other is made up of snoutless beetles. The snout beetles have their jaws at the end of the beak, and the upper lip is very much reduced.

Similarities and Differences. While the beetles have an outstanding characteristic in their sheath-wings, they show innumerable variations in size, appearance, and habits. This statement is not surprising when we consider that no fewer than 150,000 species have been studied and described. Some beetles are so tiny that they can scarcely be seen, and some are startling-looking creatures several inches in length; some are very flat, and others almost as round as balls; some are long and slim, others are circular; in color, they range from sober black or brown to brilliant reds and greens and metallic blues. In all beetles, the under part of the body, like the back, is protected by a thick, horny armor, and there is no doubt that this "shell," though easily crushed, has had much to do with making

the beetles the most numerous of insects; for the stiff and prickly substance is not especially agreeable to birds, which would otherwise greedily devour them.

Habits. There are modifications of structure to meet all their different modes of life and to aid the beetles in securing the particular



PARTS OF A BEETLE.

(a) Mouth parts; (b) head; (c) compound eye; (d) antenna; (e) first, second, third thorax; (f) femur; (g) tibia; (h) tarsal segments, (i) abdomen.

food which they prefer. Some live on vegetable matter, and certain of these species, both as larvae and as full-grown beetles, are very harmful to crops. Many live on animal food, some of them catching insects alive. Others prefer decaying matter; these latter, in their office of scavengers, render valuable service to man. Among the most helpful species are the ladybird beetles, which feed upon plant lice (aphides) and are instrumental in saving many garden plants.

Harmful Species. There are several kinds of small snout beetles that prey on farm crops; these are known collectively as *weevils*. Grain weevils, the bean weevil, and the cotton boll weevil are among the worst of these pests. Other injurious beetles include the *potato bug*, or *Colorado beetle*, a destructive enemy of potatoes, and the *June bugs*, which are the adult form of the white grubs that destroy corn, wheat, and blue grass. The *curculio* family includes some of the most injurious beetles that attack nut and fruit trees. Two obnoxious species of borers prey on apple trees. *Wireworms*, the larvae of *click beetles*, damage seeds and roots. *Carpet beetles* infest houses, and damage clothing, carpet, and furs.

Since 1916, the *Japanese beetle* has been a serious pest on fruits, shade trees, shrubbery, grass, and garden crops in parts of the Eastern United States and Canada. First discovered in New Jersey, it spread later to Pennsylvania and New York. This beetle is about one-half inch long, and has yellowish-brown wing covers and a green body. The adult beetles are much more injurious to crops than the larval grubs. They are being fought with poison sprays, quarantine measures, and parasitic insects.

BEETLES



Weevil



Stag Beetle



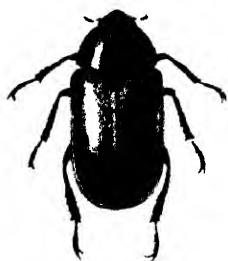
Red Milkweed Beetle



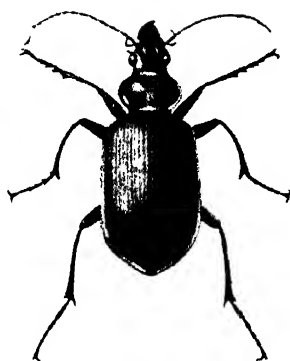
Milkweed Leaf Beetle



Goldsmith Leaf Beetle



Spotted Vine-chafer



The Searcher



Burying Beetle



Ladybird Beetles



Eyed Elater



Bombardier Beetle



Helmet Beetle



Purple Long-horn

Carl F. Gronemann

Outline and Questions on the Beetle

I. Variety of Species

- (1) Most numerous of insects, 150,000 species
- (2) Over 12,000 species in North America north of Mexico
- (3) Various sizes, shapes, and colors

II. Distinctive Characteristics

- (1) Strong mouth parts
- (2) Sheath-wings
- (3) Protective, horny covering
- (4) Habits
 - (a) Food
 - (b) Harmful beetles
 - (c) Helpful beetles

III. Life History

- (1) Complete metamorphosis
 - (a) Egg
 - (b) Larva
 - (c) Pupa
 - (d) Fully developed beetle

Questions

Why do young collectors find beetles attractive objects of study?

Why should children be taught not to kill ladybirds?

What characteristic of beetles is shown in their common name? In their scientific name?

Sketch the life history of a beetle

Why do not birds find beetles desirable food?

What shows the adaptability of these insects?

What is meant by a "complete metamorphosis"?

Into what two main groups are beetles divided? How do these differ in structure?

About how many species are there in the United States and Canada?

What great difference is there between the existence of the larva of a beetle and that of a butterfly?

Are beetles on the whole harmful or helpful?

How long does the pupa stay in its cocoon?

Name four important species of beetles

With how many of those listed here are you familiar?

Do all species of beetles eat the same kind of food?

In what country was the scarab looked upon as sacred?

What peculiar habit has given the burying beetle its name?

How many species have been identified?

Life History. No other insects have been studied as widely and as carefully as have the adult beetles, and they have always been favorite objects with collectors, because their hard outer covering makes it possible to preserve them in perfect shape; but the earlier stages of beetle life are comparatively little known. It is certain, however, that all beetles have what is known as a "complete metamorphosis"—that is, there are four stages in their development. First comes the egg, laid by the female in such a location that the newly hatched young will have food ready at hand. The larva is usually a disgusting-looking, soft, white grub, which differs from the caterpillar, or butterfly larva, in that it lives for three or four years in that state, before it becomes dormant in the pupal covering. Either in a rude cocoon of its own making or in a burrow, the pupa rests quietly for a period which varies from two to three weeks to as many years, and when it emerges it is a full-grown beetle. W.J.S.

Related Subjects. The species of beetles treated in these volumes are described under the following headings:

Bean Beetle	Hercules Beetle
Boll Weevil	June Bug
Bookworm	Ladybird
Carpet Beetle	Potato Bug
Click Beetle	Scarab
Curculio	Stag Beetle
Deathwatch	Water Beetle
Grain Weevils	Weevil

BEETLEWOOD. See COLTSFOOT.

BEETS, NIKOLAAS. See NETHERLANDS. THE (Language and Culture).

BEGGAR'S BUTTON. See BURDOCK

BEGONG, MOUNT. See VICTORIA (Australia)



BEGONIA, *be go' ni ah*, the name of a genus of juicy-stemmed herbs which in temperate climates are favorite house plants. Their

fleshy, waxy leaves, oddly one-sided, sometimes display beautiful shades of color—tinted with red, mottled with yellow, or spotted with white—and the flowers are often showy. They have a waxy look, also, and those of the common varieties range in color from pink to deep red, one flower often showing several shades. The carefully cultivated kinds grown in greenhouses, and as border plants, especially the tuberous begonias, sometimes have wonderfully developed flowers, from four to six inches across and of the deepest orange color. One advantage of begonias as house plants is that they are easily grown from "slips"; either leaf or stem cuttings take root without difficulty and produce vigorous new plants. There are numerous species and varieties. The scientific name of the begonia family is *Begoniaceae*. B.M.D.

BEHAIM'S MAP. See GEOGRAPHY, illustration.

BEHAVIOR IN CHILDHOOD. See CHILDHOOD, BEHAVIOR IN.

BEHAVIORISM. See PSYCHOLOGY (Modern Movement).

BEIRA, *beh' e rah.* See MOZAMBIQUE.

BEIRUT, *ba rooh't'* See SYRIA (The Cities)

BEL. See BAAL; BABEL, TOWER OF.

BELA KUN, *be' lah kuhn.* See HUNGARY (History).

BELASCO, *be las' ko*, DAVID (1862-), one of the best-known American theatrical managers of modern times, and a playwright of distinction. He was born in San Francisco, and in that city began his career as an actor at the age of fourteen. Finding that he had rather unusual talent in adapting plays for the stage, he turned his attention to dramatic writing, and throughout a long period he won success in three fields—as a playwright, theatrical manager, and producer. E. H. Southern, Blanche Bates, Mrs. Leslie Carter, Henrietta Crosman, Frances Starr, and David Warfield were among the famous people of the stage who played under his management, and the Republic and several Belasco theaters of New York City are important playhouses that passed into his control.

The name of Belasco is especially associated with stage realism, for it was his belief that a stage setting should correspond in the smallest details with the scene which is being represented, whether it be a restaurant, an opium

den, a second-hand clothing shop, or a drawing room. In 1915, he joined with Charles Frohman in the production of an old success, *The Celebrated Case*, several of the best players of the world being engaged for the revival of this play. Plans for future productions of similarly strong character were interrupted by the death of Mr. Frohman on the *Lusitania*.

The Plays of Belasco. Among the successful plays written by him are *The Girl I Left Behind Me* (with Franklin Fyles); *The Heart of Maryland*; *Zaza*; *The Girl of the Golden West*; and *The Return of Peter Grimm*. As manager and producer, his name is associated with such plays as *The Music Master* and *The Auctioneer*, played by David Warfield, *Madame Butterfly*, *Tiger! Tiger!*; *The Gold Diggers*; *Kiki*, *Laugh, Clown, Laugh*; and *Ladies of the Evening*.

BELEM, *ba le.V'*, another name for Para, Brazil. See BRAZIL (Cities).

BELFAST, the capital city of Northern Ireland, and the center of the Irish linen industries. It is the first city in Northern Ireland in population, manufactures, and trade, because it is advantageously situated on Belfast Lough, where the River Lagan flows into the lake. It is 113 miles north of Dublin, with a harbor which is one of the best in the United Kingdom. Although there are some unsightly slums, the city is for the most part well laid out. The shipbuilding industry is steadily increasing in importance. In addition, the city has manufactories of machinery, distilleries, flour mills, tanyards, chemical works, and more power looms and spinning mills than are contained in all the rest of Ireland. There are more than 40,000 power looms and one million spindles. The linen made in Belfast has been a superior article for many years.

Belfast was long the center of resistance to Home Rule for Ireland, and clashes between political and religious factions caused frequent riots, sometimes resulting in considerable loss of life. Population, 1926, 415,600. See LINEN; IRELAND; HOME RULE.

BELFRY OF BRUGES. See BELGIUM (The Flemish Plain).

BELGIAN CONGO, *kong' go* (the form KONGO is no longer authorized), a vast territory in South-Central Africa. It takes its name from the Congo River. This rich possession was known from 1885 to 1908 as the CONGO INDEPENDENT STATE, and since then as CONGO BELGE (Belgian Congo). It has an area of about 909,650 square miles—nearly a third as large as continental United States—and a population believed to be 8,500,000. The white people number only 13,000, and of these over half are Belgians, and 1,300 are English and American; the remainder include small groups embracing fifteen other nationalities. They are almost submerged in the great mass of black people, nearly all Bantus. This section of Africa was long the "darkest" part of the



Photo—Brown Bros.
DAVID BELASCO



Photos OROC

CHILDREN IN THE BELGIAN CONGO LIVE CLOSE TO NATURE

At left, a Mongbutu youth eating a banana, the photographer said he was on his way to school. At right, Mongbutu girls, all show the typical hair-dressing of their tribe. A part of their village appears in the background.

"Dark Continent", even yet, in a degree, it is deserving of that designation, though civilizing influences have transformed portions of it. Except for a coast line on the Atlantic Ocean a few miles in length, the colony lies entirely inland.

Story of Development. Henry M. Stanley, in 1876, first informed the world of the natural wealth of the region. King Leopold II of Belgium sent investigators, who in time verified Stanley's glowing account of industrial possibilities. In 1885, the Congo Independent State (Congo Free State) was organized. The great powers agreed to hand over this vast territory to a company named the International African Association, controlled by the Belgian government. Belgium reserved the right to annex the territory, which was eventually done, with the consent of the United States and all European powers. In 1908, the Independent State became Belgian Congo, and Leopold began to develop the rubber industry.



LOCATION MAP

While commerce was being developed, and the natives were driven under dire penalties to produce a certain quantity of rubber, great indignation was aroused throughout the world on account of cruelties which were practiced. The natives were in reality slaves, and Leopold, who was making vast sums of money out of the rubber trade, was forced to send a commission to inquire into conditions. The commission partly exonerated the king, but the existence

of atrocities was proved. When Albert I came to the Belgian throne in 1909 he corrected the evils that had arisen during his uncle's reign.

Rubber continues to be the leading article produced, but copper, coconuts, palm oil, copal, cacao, and ivory are exported in increasing quantities.

Communications. The great Congo River crosses Belgian Congo in the form of a rude semicircle, and forms the boundary between that colony and French Equatorial Africa for hundreds of miles in its course nearest the sea. For only ninety-five miles is it navigable inland from the Atlantic, because for the next 250 miles there are numerous rapids, as far as Stanley Pool, where Leopoldville is located; then for 1,100 miles there is navigable water. Several large tributaries of the Congo are also water highways for commerce.

There are over 8,000 miles of wagon roads, and about one-fourth of this mileage is suitable for automobiles. There are several short railroad lines; one extends from Boma, the former capital, inland to Leopoldville, and one runs westward from Albertville, on Lake Tanganyika, where there is water connection with the Cape-to-Cairo system. Another extends north from Elizabethville, in the far southeast. Still others are farther north in the interior; they furnish transport where the great river is not navigable.

The Towns. The capital city, since 1923, is Leopoldville; the most advanced town is Elizabethville, named for the queen of the Belgians. Boma is the seaport of the country, about fifty miles from the Atlantic. Other growing settlements are Albertville, Stanleyville, Banana, on the seaboard, Matadi, and Equatorville. None of them is large.

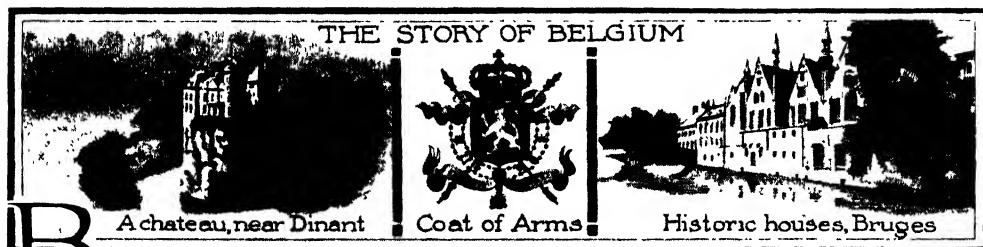
Government and Religion. The king of the Belgians is represented locally by a governor-general, and the latter is assisted in administration by several vice-governors, who administer the 175 or more districts of the colony. Responsibility for government rests with the Minister for the Colonies, in the mother country. The natives practice a form of fetishism, but missionary work is encouraged, Roman Catholic effort predominating. Gold and silver

money of Belgium is current money. The metric system of weights and measures is employed.

Related Subjects. The reader is referred in these volumes to the following articles.

Bantu	Leopold II
Congo (river)	Rubber
Fetish	Stanley, Henry M

BELGIAN HARE. See HARE, for classification; RABBIT.

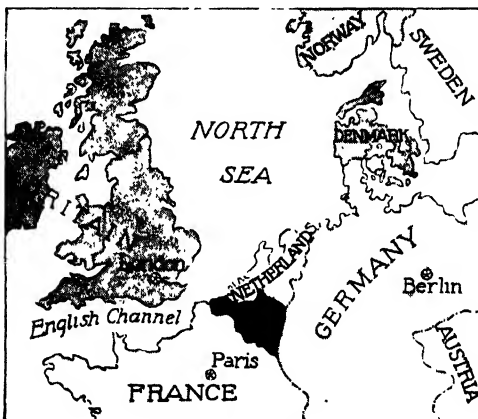


BELGIUM, *bel'ji um*, one of the smallest countries in Europe, but one that has stood in the front rank among the states of the world by its achievements in all the arts of peace, progress, and civilization. Although it has had an independent government only since 1830, in its history and traditions it is one of the oldest countries in Europe.

This is one of the few remaining kingdoms in the world, and one in which there appears to be no drift toward a republican form of government. The sovereign, King Albert, was one of the heroic figures produced by the World War, and after the war he developed statesmanlike qualities of a high order.

Location. Belgium lies on the northwestern coast of Europe, between the Netherlands on the north and France on the south. It fronts on the North Sea, with forty-two miles of unbroken seaboard; to the east lie Germany and the grand duchy of Luxemburg. The geographical situation of Belgium has shaped the character and destiny of its people more than that of any other country in the world, with the possible exception of ancient Greece. For trade purposes, it forms the natural meeting ground of the nations of Western Europe, but, unfortunately, on account of its position, it has been again and again their battleground. It has been called "the cockpit of Europe," because all the conflicts in which the leadership of the continent was sought, whether by Spain or France, by the Hapsburgs or the Hohenzollerns, were fought, in part at least, on its territory. Among the great contests on its soil may be mentioned the famous and decisive battles of Neerwinden (1693), Fleurus (1690), Ramillies (1706), Oudenarde (1708), Fontenoy (1745), Jemappes (1792), Waterloo (1815), and Ypres, Dixmude, Malines, Namur, and Mons (1914).

Area and Population. Belgium, with an area of 11,750 square miles and a population of 7,005,000 (1929), is the most densely populated country in Europe, except England, averaging 680 persons to the square mile, it therefore has an average density of population eighteen and a half times that of the United States, where the average density was 35.5 persons to the square mile at the time of the 1920 census. The most densely peopled provinces are Brabant and East Flanders, the former having an average density of 1,216 persons to the square mile. The treaty which closed the World War gave to Belgium 382 square miles of additional

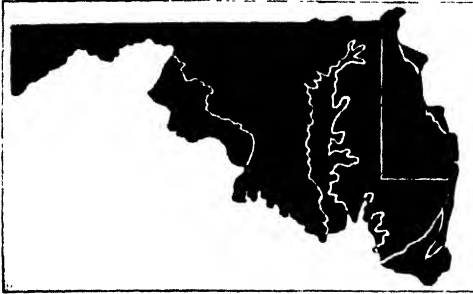


LOCATION MAP

territory, consisting of two small districts between Holland and Luxemburg, and 64,520 additional inhabitants.

The People and Their Languages. The inhabitants of this little country have a long history, and they have played a prominent part in the development of the civilization of Europe.

Caesar, in commenting on the valor of his various enemies, gave first place to the Belgae (Belgians). Its noblemen, such as Godfrey of Bouillon and Baldwin of Flanders, were leaders of several of the Crusades (which see). The



COMPARATIVE AREAS

Belgium compared with Maryland and Delaware

first industrial activity in Northern Europe was developed in the cities of this country. The guild system of the medieval towns originated in Flanders, and was introduced afterwards into England, France, and Germany. Belgium has long been famous for its historic cities, its beautiful medieval buildings, and its priceless art treasures. Its art, the expression of the ideals of the people, is indeed unique.

The inhabitants of Belgium belong to two different races, known as Flemings and Walloons, and they speak two languages. The Flemings, occupying the northern part, are of Teutonic origin and speak Flemish, which is a Dutch dialect. The Walloons, dwelling in the southern part, speak French, or rather Walloon, a dialect of French. While French is the language of commerce and of the educated people, the Flemish-speaking people are in the majority.

The fact that the people are of different ethnical stocks and speak two languages has had an important bearing upon the political problems that have agitated Belgium since 1831, and indeed there is some danger that the country will be divided politically on this question of language. French was the official language until 1870, when Flemish, as the result of a vigorous agitation on the part of the Flemings, was put on a footing of equality with French. Belgium is now a bi-lingual country, having two official languages; nearly all the cities and provinces have two names, one Flemish and the other French.

Religion. With the exception of a few Protestants, mostly foreigners, and still fewer Jews, the people of Belgium are Roman Catholics. There is no state Church, but the state grants a small contribution toward the pay of the clergy of all denominations, and toleration is guaranteed. Belgium is divided into six dioceses, presided over by the cardinal-archbishop

of Malines, who is the primate of Belgium. During the World War the cardinal of Belgium was Mercier, a fearless and outspoken champion of a stricken people. He died in 1926.

Education. Elementary education, which has been mostly in the hands of the Church, has been nearly as backward as in Spain or Italy. The struggle of the Roman Catholic clergy to obtain control over the elementary schools has been one of the leading questions in the politics of Belgium for a great many years. Recent improvements in the educational system and the support of schools by local taxation have succeeded in mitigating the situation, and illiteracy, although still great, is diminishing rapidly. Belgium has numerous good high schools, as well as a great number of special schools. Higher education is provided by the state universities at Ghent and Liège and the free universities at Brussels and Louvain; each of these contains good technical schools of arts, manufactures, engineering, and mines.

The Cities. The principal cities of Belgium have long been famous, and though ancient, have retained their importance throughout centuries of change and progress. Antwerp, a world-noted commercial center; Brussels, the capital and one of the most beautiful cities of Europe; and ancient Ghent are described in these volumes under their respective titles. Other cities of note are the following:

Bruges (in Flemish, BRUGGE), *broo' jec*, the "city of bridges," is so named from its fifty bridges which cross the network of canals flowing through the city. A canal also connects this ancient walled city with the sea. Architecturally, it is one of the most interesting cities in Europe, for it has many remarkable buildings dating from the Middle Ages. The Market Hall is a fine old building, famous for its belfry tower 354 feet high. This contains forty-eight bells, said to be among the finest in Europe. The town hall is a Gothic structure dating from the fourteenth century, the Palace of Justice is noted for its beautifully carved chimney piece, and its almost priceless art treasures. The Church of Notre Dame contains the tombs of Charles the Bold and Mary of Burgundy and a life-sized statue of the Virgin and Child, attributed to Michelangelo.

From 1240 to 1420 Bruges was one of the most important cities of the Hanseatic League (which see), and its commerce was far more extensive than at the present time. The manufactures include lace, textiles, and tobacco, there are shipbuilding yards and breweries and distilleries. During the World War Bruges was occupied by the Germans, but little material damage was done to the city. Population, over 51,500 (1929).

Liège, *le ayzh'*, is situated fifty-four miles southeast of Brussels, on both banks of the River Meuse, in a region barren of beauty and scarred by mining operations. Its ring of twelve forts, six on each side of the river, and crowning the hills which surround the city, offered the first real resistance to the forces of the Germans in their memorable invasion of Belgium in August, 1914 (see WORLD WAR).

The city was a valuable prize of war for the Germans, not only because of its strategic situation and its arsenal, but because it was Belgium's chief center for the manufacture of railroad equipment and firearms. Liège suffered greatly from the heavy bombardment to which it was subjected, but the city as a whole was spared by the Germans.

Liège is an attractive city of handsome squares, fine public buildings, and stately churches, and is the seat of a university founded in 1817. The city is located in the East-Belgian coal-mining district, and is the center of the iron and armament manufactures. It is especially important for its zinc foundries and its production of motor cars. Population, 1929, 169,500.

Louvain, *loo va.N'*, a beautiful city situated about eighteen miles east of Brussels, on the Dyle River, is one of the quaintest memorials of the days of feudalism.

Destiny decreed a tempestuous history for this little city. In the fourteenth century it was very prosperous, due to the enterprise of its cloth manufacturers. Then the weavers revolted against their rulers, and because of harsh treatment, many fled to England. The plague of the sixteenth century was another severe blow at the prosperity of Louvain. However, by means of its industries, including the manufacture of lace, starch, and chemicals, it recovered again, and flourished until the great war of 1914 destroyed many of its famous old buildings, including its celebrated university and library and some of its magnificent old churches. Its beautiful Town Hall, the Hôtel de Ville, is the most important of the city's old landmarks.

Restoration of the ruined buildings began after the war, and few outward signs of devastation now remain. The university has been reopened, and a new library, in Flemish style, was erected by American citizens. Population, about 41,000.

Malines, *ma leen'* (in Flemish, *MECHELEN*), is situated on the Dyle River, fourteen miles southeast of Antwerp. Lying in the direct line of the German drive on Antwerp, early in the World War, the city suffered a heavy bombardment, which destroyed a considerable portion of it. Restoration was undertaken as soon as the war ended. In the last half-century it has fallen behind many of the other cities of Belgium in industrial enterprise and commercial activity. Its manufactures consisted chiefly of felt and straw hats, woolen stuffs and tapestries, furniture, carpets, and large bells. Malines for centuries has been the religious metropolis of Flanders, and its monuments and objects of interest are chiefly of a sacred nature. Its most noteworthy edifice, Saint Ronauld's Cathedral, the seat of the cardinal-archbishop of Belgium, was built in the sixteenth century,

It covers almost two acres and contains an altarpiece by Van Dyck and many other fine paintings and carvings. Population, 1920, 60,440.

Namur, *na mur'*, is an important industrial city situated on the banks of the Sambre and Meuse rivers,

at their confluence, thirty-five miles southeast of Brussels. This historic and picturesque city has been many times a battle ground because of its strategic location; its citadel hill, a fortified camp of the Aduatici, was conquered by Caesar in the first century B.C.; three times the city was stormed and captured by the French, and once by William III of England, and in August, 1914, after a terrific bombardment of forty-eight hours, damaging it to an incredible extent, its circle of nine fortssur-rendered to the Germans, by whom the city was used as headquarters during the war. Namur has again become a prosperous manufacturing and trading center. Iron and coal deposits are found in the vicinity. Among the distinctive features of the place are a beautiful cathedral in Renaissance architecture, an art gallery, and the Archaeological Museum. Population, 1929, 30,570.

Ostend, *ost'*, a fashionable watering place for the whole of Europe, is situated on the North Sea, seventy-seven miles northwest of Brussels. During the summer months, from 10,000 to 20,000 visitors daily crowd its beautiful promenades along the sea walk, which is lined with shops, or enjoy the concerts in the Kursaal, the center of the social life during the season of gayety. But Ostend also has its industrial side; it is an important fishing station, and cod and herring fishing, as well as the cultivation of oysters, constitute an industry of considerable importance. The city is also an important port, having railway connections with the chief centers of the continent and steamship connections with foreign ports.

Ostend was established in the ninth century, and is memorable for a protracted siege by the Spaniards, lasting from 1601 to 1604. In 1865 its fortifications were demolished. It, too, played a conspicuous part in the World War. After the seizure of Louvain, in 1914, the British marines landed at Ostend to check the German raiders, and during the first days, during which Brussels was imperiled, it was temporarily the seat of the Belgian government. It was seized, however, and partly destroyed by the German army, and as it was used by them as a submarine base, the city suffered enormous damage from bombs dropped from the airplanes of the Allies. Restoration, however, was rapid, and scarcely a trace of the havoc remains. Population, 1929, 44,240.

Ypres, *e' pr'*, familiarly known as "*wipers*" by the British soldiers, is a picturesque city thirty-five miles south of Ostend. It was the scene of much of the severest fighting during the World War.

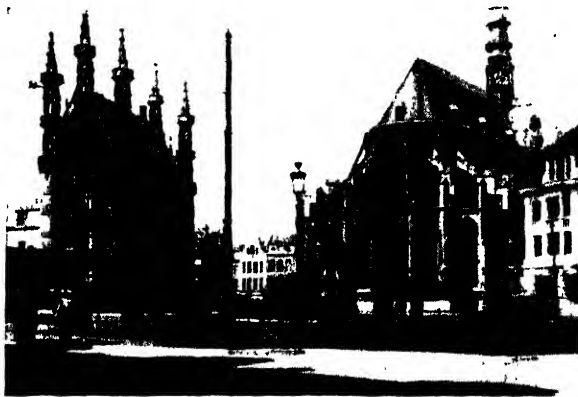


Photo. Wide World

RESTORATIONS AFTER THE WORLD WAR

The Town Hall, one of Europe's most beautiful buildings, and the Cathedral, the seat of the late Cardinal Mercier, Belgium's revered hero of war days. They are in Louvain.

The German artillery reduced the town to a state of ruin in the first year of the war. It demolished many historic buildings, including the beautiful Cathedral of Saint Martin, dating from the thirteenth century; the Halles, or cloth market; and the Butchers' Hall.

But from its ashes Ypres rose once more a beautiful city, reconstructed on its original picturesque designs. Forty cemeteries surrounding this little town of 14,000 silently remind it of the terrific scenes through which it has passed.

Physical Features. The surface of the country resembles an inclined plane, the land rising by a succession of stages from the seacoast to the low mountains of the Ardennes on the southeast. Looking inwards from the sea across Belgium, there is seen a narrow belt of dunes on the coast, then a strip of reclaimed territory, known as *polders*, almost level with the sea and protected by dykes. Following this, comes a broad central region, composed of sandy soil and extending from west to east almost across Belgium. The eastern portion, including parts of the provinces of Antwerp and Limburg, consists of sterile heaths and arid wastes, and is known as the *Campine*. The western portion is the celebrated Flemish plain, which is described below. The surface then rises gradually toward the southeast until the valleys of the Meuse and Sambre are reached. This region contains one of the best military routes leading from Holland and Germany into France, and here were situated the fortresses and important strategic points of Liège, Namur, Mons, and others, that have been the object of numerous and famous sieges. South of these rivers extends the plateau of Ardennes, reaching an average altitude of 1,400 feet and containing fine and extensive forests.

The Flemish Plain. Its Historic Cities. The most interesting part of Belgium is the Flemish plain, that represents to-day a wonderful triumph of human industry over nature. The sandy soil is nearly barren, yet the incessant labor of its inhabitants has transformed it into one of the most populous, best cultivated, and most productive areas in the whole world. The Flemish plain has played an important rôle in the civilization of Europe, and here are situated many old cities, with their relics of ancient fame and their records of past greatness. The old city walls are usually gone, but the town halls, the guild halls, and the belfry, the possession of which was for a medieval town the greatest of chartered privileges, remain. Some of these cities are but the ghosts of their former greatness. But the pigeon-haunted belfry still rises in their midst, chiming the hours and quarter-hours over streets that are now comparatively quiet, but which once were filled with bustling crowds surging to the sound of its tocsin. Such a city is Bruges, the belfry of which is immortalized by Longfellow in the well-known lines:

In the market place of Bruges
Stands the belfry old and brown;
Thrice consumed and thrice rebuilt,
Still it watches o'er the town.

Such cities also are Malines, Termonde, and Ypres. The famous hall of the clothworkers' guild at Ypres, built early in the thirteenth century, was one of the finest examples of Gothic architecture at its best. But it was something more; it was the earliest and noblest piece of architecture designed for a civic purpose in Belgium, and perhaps in Europe. It was here that the guilds were first organized (see GUILD). The Germans burned this building in 1914. In these cities of Belgium, the first free municipal life was established, and here the first industrial activity in the north of Europe was developed. In other cases, modern industrial revival has been effected upon the ancient sites. Such cities are Ghent and Antwerp; and, in other parts of Belgium, Brussels and Liège.

Rivers. Belgium is watered principally by the Scheldt and its chief tributary, the Lys, in the north, and by the Meuse and its chief tributary, the Sambre, in the south. In West Flanders, the river Yser, which receives the little Yperlee, runs into the sea at Nieuport. Besides these, there are other small streams in all parts of the country, so that Belgium is exceedingly well supplied with rivers.

The main rivers, however, the Scheldt and the Meuse, rising in France, flow northward across Belgium into the Netherlands before entering the sea, thus giving Holland control of their estuaries; this fact has greatly retarded the development of Antwerp and other towns. Treaties signed with Holland have provided for the closing of the Scheldt for warships, keeping it open to all other vessels. A treaty renewing the former agreements was signed in 1925, but was rejected by the Dutch Parliament, and not agreed to until 1928.

Industries. Agriculture. Belgium's intensive system of agriculture has attained a high degree of perfection, and the production per acre, notwithstanding the fact of a thousand years of cultivation, is the highest in Europe. Belgium yields per acre more oats, barley, potatoes, sugar beets, flax, and tobacco than any of its neighbors, Great Britain, France, Germany, Holland, or Denmark. Market gardening is extensively carried on; the surplus of vegetables, hops, and fruit is exported to Great Britain. All this agricultural wealth is raised on small farms ranging from one and one-half to twelve and fourteen acres in size, which are not owned by the men who till them, but are rented at a high price. For this reason, the agricultural classes do not enjoy any such prosperity as falls to the lot of the peasant proprietors of Holland and Denmark. In recent years, with their accustomed painstaking in-



Photo U & U

PREPARING FLAX FOR SPINNING

The view is from the left bank of a small stream in Western Belgium, ten miles from the French frontier. The flax stalks which you see held down in the river water by those heavy stones are being retted (rotted) to separate the bark from the inner fibers and to loosen the close-packed parallel fibers so that they may be mechanically separated for spinning. Not all kinds of water would answer the purpose; it must be soft and free from iron or other mineral substances that might stain the fibers. The length of time given to the process is something that requires the most discriminating judgment; a few hours too few or too many may make an enormous difference in the quality and market value of the flax. If taken out too soon, the fibers will still adhere to the bark and be broken during the process of removing the bark. If left in too long, the fiber will lose its strength, will break and tangle, and afterwards get mixed with the coarser tow. The bundles on the farther bank are just as they were brought from the fields where they were cut and dried. Other bundles have been piled up into stacks, awaiting their turn to be retted and made ready for spinning. In the near-by town, thousands of people work at home and in great factories, producing lace and fine table linens for the export trade. Forty million dollars' worth of raw flax and linen yarns are annually exported from this one small kingdom.

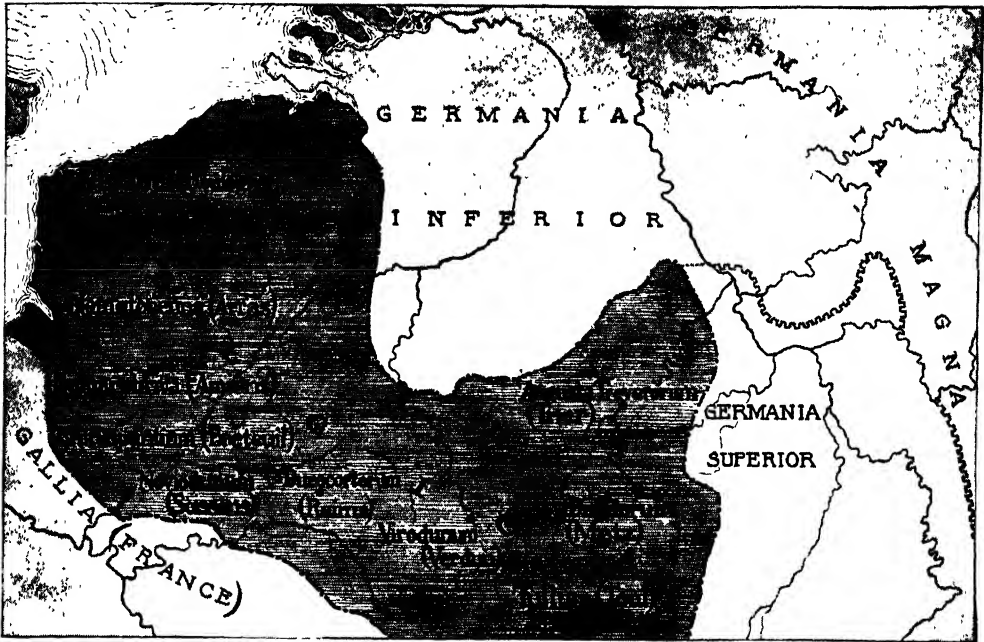
dustry, the inhabitants have reclaimed for agricultural purposes tens of thousands of acres in the sandy Campine district, hitherto a wasteland.

The pastures provide grazing for cattle and pigs in great numbers, and horse-breeding is an industry of importance.

Mining. The mineral wealth of Belgium is greater in proportion to its size than that of any other country in the world. The chief products are coal, zinc, lead, and iron. The metals are found chiefly in the Ardennes region. Rich and extensive coal fields cover an area of over 550 square miles, and extend across the country along the rivers Sambre and Meuse. The chief coal-bearing districts are around Mons, Charleroi, and Liège. Numerous quarries of marble, granite, and slate are worked; limestone hills provide the basis for cement manufacture.

Manufactures. This little country is one of the greatest manufacturing centers in Europe. Coal and iron are the bases of modern industry, and, as we have seen, Belgium possesses them in abundance. The iron and steel manufactures are on a large scale, locomotives, railway cars, and bridges ranking among the principal products. Machinery of all kinds, firearms, tinware, nails, wire, and brass are some of the chief metal manufactures, and these are produced at Liège, Malines, Namur, Ghent, Charleroi, Mons, and Brussels. Brussels and Ghent are the centers of an important jewelry manufacture.

Flanders, the center of the flax industry, has for centuries been noted for the superior quality of its linens. The manufacture of woolen and cotton goods is very extensive. It is carried on in all parts of the country, but the chief seats of the industry are at Liège, Verviers, and



BELGIUM UNDER THE ROMANS

First conquered by Julius Caesar, 57-52 B. C., it remained a part of the Roman Empire for about five hundred years.

Ghent. Lace is one of the most widely known of Belgian manufactures, much of it being hand-made; considerable weaving and glove-making are also done by hand. One of the characteristics of the industry of Belgium is the great number of articles made in the homes of the people or in small shops, which employ only a few workers. These exist side by side with large establishments, where only modern machinery is used.

Belgium is one of the leading glass-manufacturing countries in the world. Porcelain and other varieties of pottery ware of high grade are manufactured. It has also become of late years one of the principal beet-sugar-manufacturing countries of Europe. Other manufactured products are leather, chemicals, paper, margarine, beer, tobacco, and furniture.

Commerce. This little kingdom carries on an immense foreign trade. In fact, only the United States, Great Britain, Germany, France, and Holland export and import greater quantities of goods. The total value of the trade of Belgium is over 3,000 million dollars. Though it feeds more people to the square mile than any of its neighbors, the country is not self-supporting, and its imports include many food-stuffs, in addition to textiles and metal goods. Germany, France, Great Britain, Holland, and the United States, in the order named, are the leading countries connected with the foreign trade of Belgium.

The chief seaports are Antwerp, Ostend, and Bruges. Nearly seventeen million tons of shipping entered and left Antwerp yearly, before 1914, and this extensive trade has all been recovered since the war.

Transportation. Belgium has an unrivaled system of transport facilities, consisting of railways, navigable rivers, canals, and good roads. With over 6,800 miles of railroads, the country has a greater railway mileage compared to its size than any other nation. Many of the railways are owned by the government, and the fares are the cheapest in the world. Plans for the electrification of the railway system have been considered and are at present awaiting capital. There are in Belgium 1,240 miles of navigable waterways, rivers, and canals, which reach all the principal towns of the country, and are also connected with the canal and river systems of Holland, Germany, and France. The Flemish plain, especially, is intersected by a network of canals. Good roads, most of them macadamized or paved with stone, traverse all parts of the country.

Government and History

Government Belgium is governed under a Constitution adopted in 1831, which has justly been admired; it has been taken as a model by several European nations that gained their independence during the nineteenth century. The Belgian Constitution guarantees to the

citizen equality before the law, security of person and property, freedom of the press, religious freedom, and the right of association, all liberal principles that many European nations gained much later than 1831.

The form of government is a constitutional monarchy, the crown being hereditary in the direct male line. The executive power is vested in the king, who is assisted by a Cabinet appointed by him. The Cabinet must possess the confidence of the legislative body, which consists of a Senate and a Chamber of Deputies. The deputies, 186 in number, are elected directly by the people for four years. The senate consists of 120 members, who are elected for eight years. All registered voters are obliged to vote; failure to vote is punishable by law.

For administrative purposes, Belgium is divided into nine provinces. These are not artificial divisions, like the departments of France, but are based to a great extent on historic grounds. They are administered by governors appointed by the king, assisted by elected councils. The chief unit of local government is the *commune* (which see). Each commune is administered by an elective council and a mayor. In a country like Belgium, where the communal life was developed early and where the glorious traditions of the towns are cherished, the power and prestige of the mayor is very great. Very often in national crises, the joint appeal of the mayors of the chief cities has exercised a greater influence upon the people than any other agency. When Belgium was invaded by the Germans in 1914, the mayors of the cities showed that the trust reposed in them was not misplaced. They made a plucky fight for the defense of the rights of the people, very often under conditions of great risk to their personal safety.

History. First conquered by Julius Caesar fifty years before Christ, the present Belgium was a part of the Roman Empire for about five hundred years. From the time of the ancient Belgae, whom Caesar in his *Gallic Wars* called his most valiant foes, and from whom Belgium took its name, the territory comprising the modern country shared the fortunes of the other provinces of the Netherlands. It was subject in turn to Rome, France, Germany, Spain, and Austria; these earlier periods are treated under the subhead *History* in the article NETHERLANDS.

Differences did exist, however, between the people of the northern and those of the southern part of the Netherlands, and these tended to become constantly more and more marked. The inhabitants of the southern country were an agricultural and manufacturing people; those of the northern were primarily commercial. The doctrines of the Reformation penetrated the entire Netherlands, but they found no permanent hold in the southern section,

which remained true to the Catholic Church. In the north, however, the Reformation triumphed.

In 1579, a formal division occurred; the Northern, or Dutch, Netherlands declared its independence, while the southern provinces, those comprising modern Belgium, remained under Spanish rule. This Spanish domination was far from favorable to the progress of the country, for industry was stifled, and many of the most enterprising citizens left for other countries. In 1598, Philip II of Spain made Belgium a separate state, under the rule of his daughter Isabel and her husband, the Archduke Albert, and during its brief period of independence the country prospered. On the death of Albert without heirs, in 1621, Belgium reverted to Spain, and then became known as the Spanish Netherlands.

For many years Belgium was in a most unfortunate position. Spain, which was steadily declining in power, was continually at war with France, and in many of these struggles Belgium was the battle ground. Belgian territory, too, was constantly changing hands, as one or another of the countries was victorious. Naturally, this troubled condition made internal prosperity and progress impossible. In 1713, the War of the Spanish Succession was closed by the Treaty of Utrecht, by the terms of which Belgium passed to Austria.

The exhausted country did not immediately recover from the effects of Spanish misrule, but during the governorship of Charles of Lorraine, brother-in-law of Maria Theresa, which lasted from 1741 to 1780, it became really prosperous. For a few years during this period, France gained control of almost all Belgium, which was, however, restored to Austria in 1748 by the Treaty of Aix-la-Chapelle.

Independence Achieved. During the French Revolution and the Napoleonic era, the Netherlands fell into French hands, and in the readjustment of European affairs which took place at the Congress of Vienna (1815), Belgium and Holland were united as a single state. The old differences seemed to have increased rather than diminished, and the Belgians particularly objected to the union because more concessions were made to the Dutch than to them. In 1830, therefore, when the spirit of revolution was strong in Europe, Belgium revolted and set up an independent government, choosing as king a son of Louis Philippe, the king of France. He declined, and Prince Leopold of Saxe-Coburg was elected king in 1831 as Leopold I. His policies were wise, and the new state prospered, passing without upheaval through the revolutionary period of 1848. Leopold II came to the throne in 1865, and won for himself a place in history by his part in founding the Congo Free State, now known as the Belgian Congo. At his death in 1909, he



BATTLEFIELDS OF BELGIUM

On the soil of Belgium, French, British, Austrian, German, and Spanish armies at various times have met in historic encounters. Of these the battle of most far-reaching consequence was probably that of Waterloo which decided Napoleon's fate.

was succeeded by his nephew, Albert, a man of serious purpose and progressive ideas, who was destined to become the idolized leader of his people in their greatest crisis, the World War.

The extent and boundaries of the country in 1914 had been determined by the Treaty of London, signed April 19, 1839. In this treaty the great powers, namely, Great Britain, France, Prussia, Austria, and Russia, guaranteed the independence and neutrality of Belgium. Before the Franco-German War of 1870, both France and Prussia, at the request of England, pledged themselves to respect this neutrality.

From its poverty-stricken condition in 1870, Belgium had developed into one of the leading nations of the world, resembling in that capacity such old banker-nations as the English, French, and Dutch. For many years, its surplus capital was invested in enterprises all over the world.

The World War. The progress of the country

had been steady and continuous until the fateful day in August, 1914, when the World War broke out; this involved nearly all the powers of civilization. Belgium expected to remain neutral, its neutrality having been guaranteed by treaty in 1839. However, at the outset of the struggle, Germany demanded permission to pass through the country, for strategic reasons, in its campaign against France. Suddenly Belgium, although it had no part in any European quarrel and had absolutely nothing to gain by taking up arms, was confronted with the choice of either granting the demand of Germany or of protecting its independence and neutrality. Although a small nation, true to the lofty political idealism and the spiritual traditions of its people, it chose the latter course.

Under the guidance of its ruler, King Albert, Belgium decided to fight in defense of its honor, its historic heritage of freedom, and the right to be mistress in its own house. But the

OUTLINE AND QUESTIONS ON BELGIUM

Outline

I. Location

- (1) Latitude, $49^{\circ} 30'$ to $51^{\circ} 30'$ north
- (2) Longitude, $2^{\circ} 33'$ to $6^{\circ} 6'$ east
- (3) Boundaries
- (4) Effects of position on history
 - (a) Trade
 - (b) Warfare

II. Size

- (1) Comparative
- (2) Actual area

III. Physical Features

- (1) Coast
- (2) Surface
 - (a) Coastal lowlands
 - (b) The Campine
 - (c) The Flemish plain
 - (d) Highlands
- (3) Drainage
 - (a) Abundance of rivers

IV. The People

- (1) Races
 - (a) Flemings
 - (b) Walloons
 - (c) Other peoples
- (2) Languages
 - (a) Two official tongues
- (3) Education
- (4) Religion

V. Industries and Communication

- (1) Agriculture
- (2) Mining
- (3) Manufacturing
- (4) Commerce
- (5) Transportation

VI. Government

- (1) Its constitution
- (2) The ruler and his Cabinet
- (3) Legislature
- (4) Local government
- (5) Chief cities
- (6) Public debt

VII. Defense

- (1) Army
- (2) Fortresses

VIII. History

- (1) In ancient times
- (2) Part in Crusades
- (3) The rise of the guilds
- (4) Long connection with Netherlands
- (5) Separation in 1579
- (6) Unfortunate conditions under Spanish domination
- (7) Napoleonic era
- (8) Reunion with Netherlands
- (9) Independence
- (10) Steady progress
- (11) Belgium's part in the World War.

Questions

How does Belgium rank among the countries of Europe as regards crop production per acre?

What phase of the educational question has entered largely into politics?

How did the ancient inhabitants of Belgium rank among the Gauls as to bravery?

What is the most valuable output of the mines?

How did the country prove its progressiveness in making its constitution?

Why could not the inhabitants of Belgium and Holland be contented under one government?

Name five important battles that have been fought on the soil of Belgium

What effect has the location of the rivers had on the development of Antwerp?

Where was the government of the country established during the World War?

What relation was there between ancient Flanders and modern Belgium?

What were the guilds, and what part did Belgium play in their development?

What was the most strongly fortified city in the country?

What attitude did the country wish to maintain in the World War?

How does it happen that the Flemish plain, naturally an unfertile region, is one of the most densely populated territories in the world?

QUESTIONS ON BELGIUM—Continued

- What ornamental wares are manufactured in Belgium?
 What phase of financial activity proved the prosperity of the country?
 What are *polders*, and why are they necessary?
 How do you account for the fact that the mayors are so much more important here than in most countries?
 What was the effect of Spanish rule on Belgium?
 When was the neutrality of the country guaranteed, and by what nations?
 To what Church do most of the people belong?
 What two mineral resources have made possible the development of great manufactures?
 When before 1830 was the country independent?
 Why are not the Belgian farmers as prosperous as those of Holland?
 Who are the Flemings? The Walloons? To which race of people is each most nearly allied?
 Why is the country called "the cockpit of Europe"?
 What has been the difference in the history of Bruges and that of Antwerp?
 Who was the first king of the new country? What was the most important achievement of his successor?
 Where is the Campine, and of what does it consist?
 To how many countries has the territory composing Belgium belonged in the course of its history?
 How many kings has the country had since its final declaration of independence?
 Who was king at the outbreak of the World War?

country had to pay a heavy price for this decision, for it became once more the battle ground of Europe, the early scene of the greatest and most destructive war in human history. Its beautiful countryside was devas-

back the invaders. Its defense was heroic, but the little Belgian army was pushed back by force of numbers.

The heroic defense of Liège retarded the German advance, but within a month the Germans had occupied practically the whole of Belgium, except Antwerp and the coast. In October, Antwerp, which had been considered an impregnable fortress, also was taken, after a ten-day bombardment. The government of Belgium, which had first been transferred from Brussels to Antwerp, was then transferred to Ostend, and finally to Havre, in France.

The Germans could not entirely clear Belgian soil of Belgian soldiers. The extreme north-western corner remained in the hands of its defenders throughout the war, and though only a few square miles remained to them, their stubborn resistance commanded the admiration of all civilized peoples. Ypres, near the French boundary, was pounded repeatedly by heavy artillery and "ground to powder"; some of the heaviest fighting of the war occurred here, in which Canadians and Australians particularly distinguished themselves.

The peace conference could not hope to force Germany to pay full cash value for the billions of dollars lost through the great destruction of civilian property, but it provided that the first 2,500,000,000 francs (\$500,000,000) exacted from the defeated nation should be paid to Belgium.

In January, 1923, the Belgians joined their



Photo Wide World

MANY BELGIAN DOGS EARN THEIR LIVING

This one assists his master in delivering milk throughout the village

tated, its pleasant villages were razed, many of its historic monuments and art treasures destroyed, its ancient seats of learning rendered desolate, and its people driven from their homes to seek refuge in foreign lands. No greater tragedy has ever befallen a nation.

Having disputed the passage of the German army, the Belgian forces met at Liège to turn

French allies in an occupation of the German Ruhr district, to force war payments.

Reconstruction in Belgium is quite complete, the houses, public buildings, and roads having been practically all rebuilt, and nearly all of the Belgian industries show an improvement over pre-war status. A.E.L.

Related Subjects. The reader who is interested in Belgium will find the following articles helpful.

CITIES AND TOWNS		
Antwerp	Brussels	Ghent
RIVERS		
Meuse		Scheldt
HISTORY		
Aix-la-Chapelle, Treaties of	Succession Wars	
Albert I	Utrecht, Peace of	
Belgian Congo	Vienna, Congress of	
Gaul	Walloons	
Ruhr	World War	

BELGRADE, capital of Yugoslavia (which see).

BELISARIUS, *bel i sa' ri us*. See **VANDALS**.

BELIZE, *beh leez'*, capital of British Honduras (which see).

BELKNAP, *bel' nap*, MOUNT. See **WASATCH MOUNTAINS**.

BELKNAP, WILLIAM W. See **IMPEACHMENT**.

BELL. In modern life, there is perhaps no sound more familiar than the ringing of a bell. Those who trust to the morning alarm clock may be awakened by the tinkling of a bell; during business hours a bell calls messengers, and in some cases signals the time to commence and to stop work; the deep-sounding bell summons worshipers to church; the "curfew tolls the knell of parting day." So familiar is a bell that many articles which would be hard to describe otherwise are plainly visualized by the expression "bell-shaped."

[Some of the bells referred to above are operated by electric current, these are described under the title **ELECTRIC BELL**.]

Ancient Bells. Before the Christian Era, bells as we know them probably did not exist. Bars of metal and instruments shaped like cymbals were used for the purpose of announcing meetings. The modern cup-shaped instrument dates from the fourth century, and apparently was first used to summon the devout Christian people to worship. That the bell has always been closely associated with religious exercises is shown by its use in the pronouncement of excommunication from the early Roman Catholic Church by *bell, book, and candle*, and by the tolling of bells to announce death. Bells were introduced into France in 550, and into England about a century later. One of the oldest bells existing in Great Britain is preserved at Belfast, and is known as "the bell of Saint Patrick's will." It is six inches high, five inches broad, and four inches deep. It is thought to date from about 652.

In the thirteenth century, it became customary to make large bells and place them in special towers, where they were sounded by being struck with a metal rod, or by being swung so as to be struck by a metal clapper suspended within the hollow of the bell. In 1400, a notable bell weighing six and one-half tons was made in Paris, and from that time their size increased.

Chimes. Several bells, whose tones are made to correspond to the tones of the musical scale, may be hung together, and when struck one at a time, a simple tune is heard. When operated by hand, a rope is attached to each bell, and the operator pulls on the rope attached to the bell whose tone is next required. Most



THE GREAT BELL OF MOSCOW

chimes in great cities are now electrically operated; the performer sits at a keyboard, similar to that of an organ, though it has fewer keys—one for each bell—and as the keys are depressed one by one, an electrical connection sounds the bells.

Famous Bells. The largest bell in the world is the "Tsar Kolokol" of Moscow, weighing 193 tons. It was never rung, however, as it was cracked in the making and a piece eleven tons in weight broke off (see illustration). The most famous bell in the United States is the Liberty Bell, which pealed forth the news of the signing of the Declaration of Independence and the birth of a nation (see **LIBERTY BELL**). "Big Ben," in the Westminster clock tower of the Houses of Parliament in

London, weighs thirteen and one-half tons, and was made in 1858. It is recorded that on one occasion Big Ben boomed forth thirteen strokes at the hour of midnight, and numerous pieces of fiction have centered their plots around the alleged incident. The Cathedral of Notre Dame, Montreal, Canada, has a bell weighing fourteen and one-half tons. The great bell of Cologne Cathedral, cast from the metal of cannon captured from the French in 1870, weighs twenty-seven and one-half tons. In Burma, there is a pagoda with a bell weighing eighty tons. All of these bells of great size and weight are sounded by being struck; they are not movable.

How Bells Are Made. Ancient bells were made in pieces, riveted together, but it is now customary to mold them in a single piece from molten metal Bell metal, as it is called, consists of a mixture of copper and tin, in proportions of four parts of copper to one of tin. Two molds are made of baked clay, one solid, to produce the open interior; the other, hollow, to give form to the exterior. Between the two molds, the molten metal is poured. The clay molds are then destroyed, and the bell is complete. A very large bell may require several weeks to cool thoroughly.

[See the article **BRONZE** for a statement relating to bell metal; also **FLORIDA**, for the Bok "Singing Tower"]

Uses of Bells. In addition to its original use as a summons to worship, the swinging bell has for centuries been employed for numerous important purposes. In the feudal days of England, a bell at evening signified that it was time to "cover the fire," and was called the *curfew*; this custom is immortalized in Rose Hartwick Thorpe's poem, *Curfew Must Not Ring To-night*, a tragic incident of the Cromwell era. In pioneer days in America, a bell pealed warning of Indian attacks. At sea, time is marked by the sounding of a bell, and buoys sometimes carry bells to warn ships off dangerous coasts. In England, a "town crier" was sent around in small communities in olden days to announce sales or other important events, and he rang a bell to attract attention. This custom continued for centuries.

Nautical Bell. See **SHIP**.

BELL, ALEXANDER GRAHAM (1847-1922), an American scientist, the inventor of the telephone, an instrument which has become one of the prime necessities of the age. Bell's first crude telephone was patented in 1876, and was exhibited at the Centennial Exposition. Its possibilities were evident, but it

was far from being a satisfactory instrument. The inventor never ceased his experiments upon it, and by successive improvements brought it to such perfection that to-day the human voice, without loss of tone values, is carried along a wire spanning the width of a continent, and under the sea to foreign lands.



HOW BELLS ARE MADE

Bell was not the only experimenter with long-distance conversation. Elisha Gray (which see) also invented a telephone, and he applied for a patent on the same day as that on which Bell sent in his application, but Bell was adjudged to have the prior claim, and his rights were later sustained against all claimants. The original Bell Telephone Company has held practically a monopoly of telephone business in the United States. It is stated on good authority that a thousand million conversations are held over the Bell telephones of the United States and Canada annually. See **TELEPHONE**.

Alexander Graham Bell was born in Edinburgh, Scotland. He received his education there and in London, and in 1870 moved to Canada with his father, who was the inventor of the "visible speech" method of teaching deaf-mutes to talk. In 1872, the younger Bell became professor of vocal physiology at Boston University, and there introduced his father's system. Even after his inventions demanded most of his time, he never lost interest in the education of the deaf, and wrote various works which entitled him to rank as an authority on that subject. His inventions, besides that for which he is chiefly noted, include the photophone, in which sounds are conveyed by a vibratory beam of light; the graphophone, the forerunner of the phonograph; and the telephone probe, which detects bullets in the human body.

BELL, A. MELVILLE, pioneer in education of the deaf and dumb. See **DEAF AND DUMB** (The Education of Deaf-Mutes).

BELL, JOHN (1797-1869), an American statesman, prominent in all the vital movements that preceded the War of Secession. He

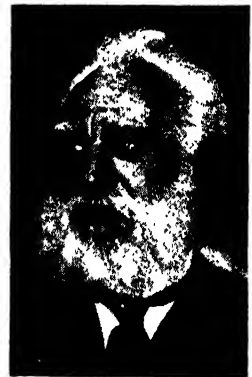


Photo. U. S. U.

ALEXANDER GRAHAM BELL

was born near Nashville, Tenn., was graduated from what is now the University of Nashville in 1814, was admitted to the bar at the age of nineteen, and when but twenty was elected to the Tennessee state senate. So able did he prove himself in that body that in 1827 he was sent to Congress, where he served until 1841, becoming known for his support of a protective tariff. In 1832 he vigorously supported Jackson in his campaign for the Presidency, and two years later was made Speaker of the House. President Harrison appointed him to his Cabinet in 1841 as Secretary of War, but at Harrison's death and the succession of Tyler, Bell and the others of the Cabinet resigned.



Photo Brown Bros

JOHN BELL

From 1847 to 1859, he was a member of the United States Senate, where he favored Clay's compromise measure of 1850 (the "Omnibus Bill"), voted against the Kansas-Nebraska Bill, and opposed the repeal of the Missouri Compromise. The Constitutional Union party nominated him for President in 1860, and in the ensuing election Tennessee, Virginia, and Kentucky gave him their electoral votes (see electoral map, in article LINCOLN, ABRAHAM). For a time he opposed the secession of Tennessee, favoring a policy of armed neutrality for that state, but later he actively supported the Confederate cause, though he took no part in the war.

Related Subjects. The reader is referred in these volumes to the following articles

Kansas Nebraska Bill
Missouri Compromise

Omnibus Bill
Political Parties

BELL, NAUTICAL. See SHIP, subhead.

BELL, ROBERT (1841-1917), a Canadian geologist who made the first surveys of many of the rivers and lakes of Western Canada. These included Great Slave Lake, Lake Nipigon, part of Lake of the Woods, Lake Winnipeg, and the Athabaska, Slave, Nelson, and Churchill rivers. After studying at McGill University, he joined the staff of the Geological Survey in 1857, when he was only sixteen years old. For half a century thereafter, the reports of his geological and topographical surveys were the chief sources of information about the West. He was geologist on an exploring expedition to Hudson Bay in 1884, and in 1897 he surveyed the south coast of Baffin Land and reached the great lakes in the interior. The value of Bell's work was recognized by his appointment as

director of the Dominion Geological Survey; by the award of honorary degrees from McGill, Cambridge, and other universities, and by membership and office in many honorary scientific societies.

BELLACOOA, *bel a kool' ah*. See INDIANS, AMERICAN (Most Important Tribes).

BELLADONNA, *bel' la don' ah*, OR **DEADLY NIGHTSHADE**, a bushy herb of the nightshade, or potato, family, the source of the valuable drug belladonna. The plant is native to Europe and Asia, and is cultivated as a garden ornamental, as well as for medicinal purposes. All parts contain a poisonous alkaloid, from which belladonna is made. The latter is widely used for the relief of asthma, bronchitis, whooping cough, and colic and other intestinal troubles; plasters or liniments made from belladonna are applied externally to soothe the pains of inflammation and neuralgia. Belladonna is also valued highly by oculists because of its paralyzing effect on certain muscles of the eye. This causes the pupil to expand and greatly aids the doctor in his exam-



BELLADONNA

(a) Branch, (b) fruit.

ination and treatment of the eye. No one but a competent oculist should ever apply belladonna to the eye, and the use of this drug by persons who hope to add beauty to the eye by increasing its brilliance cannot be too strongly condemned. In fact, no belladonna preparation should ever be used for any purpose except under the direction of a physician.

The plant grows to a height of from two to six feet, and bears drooping, bell-shaped, purple flowers; it has broad, oval leaves, and large black berries. Persons are known to have died from eating the berries, and even breaking off a spray may cause eye trouble. Children, especially, should be warned against touching the plant. Vinegar is a simple remedy in cases of poisoning, but a physician should, if possible, be summoned immediately. B.M.D.

Derivation of Name. Once upon a time Italian ladies used the juice of belladonna as a face ointment,

and from this custom, as well as from its use in beautifying the eye, came its name, which is the Italian for *fair lady*.

Scientific Names. The plant belongs to the family *Solanaceae* (see NIGHTSHADE). Its botanical name is *Atropa belladonna*. Deadly nightshade should be distinguished from common, or black, nightshade (*Solanum nigrum*), a less dangerous plant.

BELLAIRE, O. See OHIO (back of map).

BELLBIRD, the name of several species of birds whose notes sound like the tolling of a bell. The most famous of these is a South American songster of glossy white plumage, which dwells among the dense forests of the Amazon region. Its clear, melodious notes, which carry for a long distance, may be heard at midday. To some travelers, these seem like the blow of the blacksmith's hammer on the anvil. A remarkable feature of this bellbird is a fleshy projection about three inches in length, growing from the base of the beak, black in color, and dotted here and there with starlike tufts of small feathers. It hangs down loosely at the side of the beak, except when the bird becomes excited and when it utters its bell-like tones. Then the projection slowly extends sometimes to a length of five inches, and may assume an erect position. This bird is classed as *Chasmorhynchus niveus*.



THE AMAZON
BELLBIRD

D.L.

The name *bellbird* is applied in Australia and New Zealand to two members of the honey-sucker group, birds which feed on the nectar of flowers. The New Zealand bellbird utters notes that sound like the tinkling of a silver bell.

BELLEAU, bel' o', WOOD. See WORLD WAR (Americans in Battle).

BELLE ISLE, bel' ile, STRAIT OF, a body of water separating the island of Newfoundland from the mainland on the north and west. This strait, about eighty miles long and about twelve miles wide, is the northern entrance from the Atlantic Ocean into the Gulf of Saint Lawrence. The passage through is made not without danger, but as the route is the shortest from Montreal and Quebec to England, it is usually followed by ocean liners.

At the eastern end of the strait is Belle Isle, the island, which lies nearly midway between the Newfoundland and Labrador shores. The island has an area of fifteen square miles. At its southern end, where steamships pass, is a great lighthouse whose signal light is visible for nearly thirty miles.

BELLEROPHON, be lair' o fon, a mythological Greek hero, the son of Glaucus, king of Corinth, and the slayer of the dreadful, fiery Chimaera (which see). He was sent by the

king of Argos to the Lycian king with a sealed message asking his death, and to accomplish this he was sent to kill the fire-breathing monster. He was assisted by the goddess Minerva, who gave him the golden bridle with which he secured the winged horse Pegasus (which see). Mounted upon this steed, he was able to attack the fabled monster from above and slay it.

Seeing that Bellerophon was a favorite of the gods, the king gave him his daughter in marriage and made him heir to his throne. Legend says that in his later years Bellerophon, made proud by his good fortune, attempted to mount upon Pegasus to the home of the gods, and that Jupiter, angered by his boldness, caused him to be dashed to the earth. Lame and blind, he passed his few remaining years in misery.

In Literature. Hawthorne has told delightfully the story of Bellerophon's great victory in *The Chimaera*, omitting the later mournful part of the tale

He whose blind thought futurity denies,
Unconscious bears, Bellerophon, like thee,
His own indictment; he condemns himself

BELLES-LETTRES, bel let' 'r, an expression applied in a somewhat indefinite way to those forms of literature that appeal to the emotions and the imagination. *Belles* and *lettres* are two French words meaning *beautiful* and *letters*, which, taken together, mean *fine literature*, or *polite literature*. Poetry, fiction, literary criticism, dramatic writings, and certain forms of history are included in the term, as distinguished from the more practical or prosaic forms of literature, such as scientific treatises. There is, however, no hard and fast rule governing the use of the term. The first English writer to employ this expression was Jonathan Swift, who in 1710 made use of it in the periodical called *The Tatler*.

BELLEVILLE, ILL. See ILLINOIS (back of map).

BELLEVILLE, N. J. See NEW JERSEY (back of map).

BELLINGHAM, WASH. See WASHINGTON (back of map).

BELLINI, bel le' ne, GIOVANNI (1430 or 1431-1516), the greatest figure in early Venetian painting, and the most important member of a family of Italian painters who lived during the early Renaissance. Giovanni received his first lessons in painting from his father, Jacopo Bellini, a distinguished portrait painter. His fame rests chiefly on his religious paintings, many important examples of which survive. One of his numerous Madonnas hangs in the Metropolitan Museum of New York, and there are others in private collections; his *Christ on the Cross* and *Transfiguration* are in Venice; the National Gallery of London possesses his *Agony in the Garden*.

His early works seem to have been painted under the influence of profound religious feeling, and show great severity of treatment, but his later canvases exhibit a blending of noble form and soft, rich color that is characteristic of Venetian painting at its best. He was commissioned to paint several great altar pieces for churches in Venice, and he assisted his brother Gentile in the decoration of the ducal palace at Constantinople. All of his paintings in the latter city were destroyed by fire, and this was the fate also of his work on the decoration of the great council hall in Venice. Bellini was also distinguished as a painter of portraits; one of his masterpieces, the portrait of Doge Loredan, is now in the London Gallery. His influence on the art of his time was profound, and among his numerous pupils were Giorgione and Titian.



Photo: Visual Education Service
GIOVANNI BELLINI

From a portrait painted by himself. It hangs in the Uffizi Gallery, Florence.

BELL METAL. See BRONZE; BELL.

BELLOWS, a wind-making machine, used to fan flames to intensify their heat, or to operate a reed organ or pipe organ. The bellows of a blacksmith shop has two compartments formed by three boards and soft, airtight leather sides. By a simple arrangement of weights and levers which move the upper and lower boards, air is first drawn into the under compartment, then into the upper, and then forcibly expelled through a nozzle facing the forge. The advantage of two compartments is a continuous current of air, but small bellows, with a valve at the bottom and a nozzle through which the air is expelled by pressure, are operated by hand to quicken the burning of fires in open hearths and grates. Bellows of this type have only a single chamber. See BLOWING MACHINES.

BELMONT, the name of a family of American financiers, two of whose members, father and son, achieved distinction in national life.

August Belmont (1816-1890) was born in Germany and was sent to the United States in 1837 as a representative of the banking house of the Rothschilds. He was Austria's consul-general at New York from 1844 to 1850, and in 1854 he became American minister to Holland. In addition to a business career which would usually demand all of one's time, he took an active interest in politics, being chairman of the national Democratic committee for twelve years. He was also an eager sportsman and a collector of paintings.

August Belmont (1853-1924), son of the above, also became a prominent capitalist. He rose to posts

of officer and director in many large railway, banking, and manufacturing corporations, including the consolidated traction lines of New York City. Like his father, he became interested in Democratic politics. In 1910 he married Eleanor Robson, a leading actress.

BELOIT, Wis. See WISCONSIN (back of map).

BELSHAZZAR, *bel shaz' ar*, the king of Babylon who saw the "handwriting on the wall" which was interpreted by the prophet Daniel (*Dan. v*). Belshazzar was the last of the Babylonian kings, and it is believed that he reigned for a time with his father Nabonidus. He was killed in the storming of Babylon by Cyrus, according to the account in *Daniel*, on the night in which he saw the writing on the wall.

The following stanza contains the opening lines from a song which graphically describes this episode:

At the feast of Belshazzar and a thousand of his lords
As they drank from golden vessels, as the Book of

Truth records,

In the night, as they reveled in the royal palace hall,
They were seized with consternation—
'Twas the hand upon the wall

BELUGA, *beh loo' gah*. See STURGEON.

BEMIS HEIGHTS, BATTLE OF, an engagement of the Revolutionary War (which see), more popularly known as the first Battle of Saratoga.

BENARES, *ben ah' rez*. See INDIA (Cities).

BENEDICT, *ben' e dikt*, the name of fifteen Popes, of whom the last to assume the name will probably be ranked by historians as most important. The first Benedict held the exalted office from the year 574 to 578. The others who are most worthy of mention among the fifteen are the following:

Benedict VIII, who was raised to the Papal chair in 1012 and ruled until 1024, had to contend for his right to the office with the antipope Gregory VI, but was confirmed in his possession of it by Emperor Henry II. His later reign was disturbed by contests with the Saracens, but Henry remained his friend and helped him to gain possession of the island of Sardinia, a Saracen stronghold. One of his interdicts was directed against marriage of the clergy. See POPE (Antipope).

Benedict IX, nephew of Benedict VIII, was first chosen Pope in 1033, and lived until 1056. Within that time, however, he did not serve as Pope for more than eight months at a time, for he was constantly being deposed by one power or another. Four times he was reinstated, but in 1048 was permanently superseded (first by Damasus II, then by Leo IX), and retired to a convent, where he died.

Benedict XIV (1675-1758) was worthy to rank with the very ablest holders of the Papal throne. After having served as bishop of Ancona, archbishop of Bologna, and cardinal, he became Pope on the death of Clement XII, in 1740. He distinguished himself especially by his interest in education and in archaeological matters, establishing several chairs in the University of Rome, founding academies, and direct-

ing the excavation of various Roman antiquities. A man of uprightness and sincerity, he labored for reform among the clergy. His chief work, *On the Beatification and Canonization of Saints*, is considered an authority on the subject.

Benedict XV (1854-1922), GIACOMO DELLA CHIESA, became Pope at a troublesome time, shortly after the outbreak of the gigantic World War, in 1914. He was born at Pegli, Italy, in 1854, was ordained priest in 1878, and in 1887 became secretary to Cardinal Rampolla, then the Papal Secretary of State. In 1907, he became one of the Advisers to the Holy Office, and later in the same year was appointed bishop of Bologna. On May 30, 1914, he was created cardinal, and a few months later, after the death of Pope Pius X, he was chosen Pope on September 3, in a conclave which lasted only four days. This was the shortest conclave in the history of the Papacy, and no other Pope has been chosen after so short a service in the office of cardinal.

Pope Benedict came to his high office after a brief but thorough training. While secretary to Cardinal Rampolla, he was intimately connected with the negotiations between the Papacy and the European powers, thus acquiring a knowledge of facts and diplomatic methods which were of great value to him in the delicate situations growing out of the World War. Repeatedly during that great conflict he endeavored to bring peace to the war-torn countries, but his kind offices were rejected.



Photo U & U

BENEDICT XV

BENEDICT, SAINT, founder of the Roman Catholic Order of Benedictines (which see). See, also, MONASTICISM.

BENEDICTINES, *ben e dik' tinz*, a religious order of men, so named because of its adherence to the rule of life dictated by Saint Benedict. His idea was that each monastery should be a separate organization, and should, for the monk, take the place of the family. The first monastery of the order was established by Benedict at Monte Cassino, in the Apennines, in the year 529. The order spread rapidly, and in the next century the Benedictines were foremost in implanting Christianity and civilization in the West. During the Dark Ages, when monasteries were the only places where the followers of the Church could find meeting places of retreat from the social classes, the order was very influential in preserving some of the traditions which the bishops had succeeded in keeping alive.

The Benedictines were noted for their piety and for their encouragement of learning. Within their monasteries, no branch of art or industry known at that time was neglected, and there, too, were made many of the books that were written before the invention of printing.

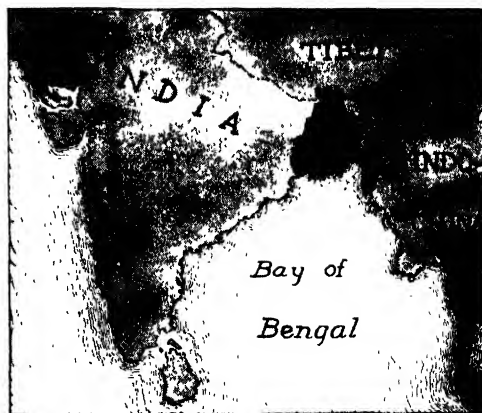
BENEDICTIS, JACOB DE. See HYMNS AND HYMN TUNES.

BENEFIT ASSOCIATIONS. See FRATERNAL SOCIETIES.

BENEFIT OF CLERGY, the privilege enjoyed by the clergy of the medieval Church which exempted them from the jurisdiction of ordinary courts and made them responsible to their bishops or to Church courts. Originally, this exemption applied only to the clergy, but it was later extended to all clerks; and since everyone who could read and write even a little was considered a clerk, the privilege was much abused. A layman could receive the benefit of clergy only once, however, and before obtaining his liberty he was branded on the thumb, a punishment which later was commuted to whipping, imprisonment, or banishment. The benefit of clergy was abolished in 1827.

[One of Kipling's finest stories is entitled *Without Benefit of Clergy*, but he used the phrase in an entirely different sense from that indicated above.]

BENGAL, *ben gawl'*, one of the three presidencies, or large governing units, of India, the others being Bombay and Madras. In this small territory of about 77,000 square miles,



LOCATION MAP

Bengal (in black) and the Bay of Bengal

there are nearly 47,000,000 people; few other regions in the world are more densely populated. Mohammedans and Hindus predominate, but many religions and languages are represented.

Geographical Features. Bengal lies at the head of the Bay of Bengal, and comprises the

choicest land of India. Just as Egypt is indebted to the Nile for its fertility, so Bengal soil is composed of the rich silt brought down by the Ganges and Brahmaputra rivers from their high Himalayan sources.

Industries. Bengal is distinctly agricultural. The soil in the Ganges and Brahmaputra valleys is very fertile, and large returns are received for labor, even though methods employed are most primitive. The most important crop is rice, the principal food of the people. A high-grade cotton is grown in Bengal, and there are great fields of jute, tea, opium, sugar cane, and wheat.

The coal and iron mined in the province encourage manufactures, especially of cotton textiles, jute, and sugar. There are some fine steel mills, and numerous modern cotton factories.

Three lines of railway meet at Calcutta, the capital of Bengal and the largest city of India; and from that center a huge commerce is carried on, largely with the United Kingdom.

History and Government. Bengal had a long independent existence before it began to be ruled by the Mogul emperors, from whom it was wrested in 1757 by the English under Clive. British rule in Bengal was confirmed by Warren Hastings, and the province was early recognized as one of the most valuable parts of India. In 1912 Bengal was raised to the rank of a presidency.

The chief executive of Bengal is a governor, appointed by the government in London, who is assisted by Indian ministers. There is also an elected legislative council of 140 members. Calcutta, once the capital of all India, remains the capital of Bengal; Darjiling, the "city above the clouds," is the summer residence of the governor.

Related Subjects. The reader is referred in these volumes to the following articles

Calcutta	Hastings, Warren
Clive, Robert	India

BENGAL, BAY OF, the northern portion of the Indian Ocean, lying between India and Burma. It receives the waters of the Ganges, Brahmaputra, and Irrawaddy rivers, and on or near its shores are the important towns of Calcutta, Madras, and Rangoon. In the eastern part of the bay are the Andaman Islands, on which a prison colony is maintained by the Indian government. Off the coast of Burma is a chain of islands containing active volcanoes which frequently erupt great quantities of mud, sometimes sufficient to form fresh islands, which after a time are washed away by the sea.

BENGALI, *ben gah' le*, one of the modern languages of India, spoken by about 40,000,000 people in Bengal. Related to the Sanskrit, it is written in characters derived from that

language, and it also possesses many words borrowed from the Sanskrit. The name *Bengali* is an English form, its native form being *Banga-Bhasa*. Its grammar bears a resemblance to the modern Persian, and in some degree, to the English. Of the several Bengali dialects, that spoken at Calcutta is the standard. Bengali literature dates from the beginning of the fifteenth century; the greatest name in its history is that of Rabindranath Tagore, the poet who received the Nobel prize for literature in 1913. He writes in English, however, as well as in Bengali.

Related Subjects. The reader is referred in these volumes to the following articles

India (Language)	Tagore, Rabindranath
Sanskrit Language and Literature	

BENGAZI, *ben gah' ze*, a city in Libya (which see).

BENGOUGH, *ben goff'*, JOHN WILSON (1851-1923), a Canadian caricaturist, journalist, and poet, and a leader in the single-tax movement. He was born in Toronto, where he began the study of law, which he soon dropped for journalism. In 1873, he established a humorous weekly called *The Grip*, illustrated by himself. For nearly twenty years this paper held a unique place in Canadian life, and Bengough's good-humored, yet sharp, wit exposed the weaknesses of many statesmen. After 1892 he contributed to Canadian and English newspapers, and also lectured in Canada and other countries. Upon the formation of the Royal Canadian Academy of Arts, he was appointed an associate.

Bengough was the author of the famous election song, *Ontario, Ontario*. Among his publications are *Popular Readings*, *Original and Selected*, *Caricature History of Canadian Politics*, *Molloy Verses Grave and Gay*, *The Up-to-Date Primer*, *A First Book of Lessons for Little Political Economists*, is a humorous exposition of the single-tax theory.

BENGUELA, *ben ga' lah*, **CURRENT**. See OCEAN (Ocean Currents).

BEN-HUR, a novel by General Lew Wallace, of which over 1,000,000 copies have been sold. The dramatic version produced in 1899, nineteen years after the book first appeared, was also very popular, and the spectacular features, particularly the magnificent chariot race which Ben-Hur won against terrible odds, later made it a striking and successful moving-picture play.

The scene of the story is laid in the time of Christ, and its hero is a young Jew, Ben-Hur, who by reason of the enmity of Messala is wrongly convicted of a crime and sentenced to slave in the Roman galleys. His adoption by the Roman commander Arrius; his return to Palestine to seek his mother and sister; the furious contest with his old enemy in the chariot race; and his final conversion to Chris-

tianity, make a powerful story. See WALLACE, LEWIS.

BENI, *bah' ne*, **RIVER**. See BOLIVIA (The Land and Its Rivers).

BEN'JAMIN, whose name means *son of my right hand*, was the youngest and the favorite son of Jacob, and a brother of Joseph. No finer story was ever written than that of Joseph and Benjamin, beginning with *Genesis XLII*.

He became the founder of the Benjamites, who in the march through the Wilderness had the honor of being placed next to the Tabernacle. The land assigned the Benjamites was between that of Ephraim on the north and Judah on the south. The territory was small, but important, since it was the key to the entrance from the east to the Promised Land. The Benjamites were famous warriors, and the tribe contained many men noted for their skill in the use of the left hand. The Benjamites were nearly destroyed in a war which they waged against all the other tribes of Israel (see *Judges XIX-XXI*), but later they recovered their strength, and at the division of the kingdom united with Judah. See JACOB; JOSEPH.

BENJAMIN, JUDAH PHILIP (1811-1884), an American lawyer and statesman, commonly known during the War of Secession as "the brains of the Confederacy." His parents were English Jews. He was born in the West Indies, but when still a child was taken to Wilmington, N. C. After studying at Yale, he was admitted to the bar in New Orleans in 1832, and soon rose to a high rank in his profession. Elected to the United States Senate in 1852, he was active in the Southern cause, and with the secession of Louisiana in 1861 he withdrew from the Senate. His pronounced ability as Attorney-General and as Secretary of State in the Cabinet of the Confederacy won him the name referred to above. At the close of the war, he went to London, where he built up a large practice. See CONFEDERATE STATES OF AMERICA.

BEN LOMOND, *ben lo' mund*, a mountain in the west-central part of Scotland, made famous by Sir Walter Scott's *Lady of the Lake*. It is just east of Loch Lomond, and is the southern extremity of the Grampian Mountains, the Central Scottish Highlands. Ben Lomond rises 3,192 feet above the sea, and on its north side is a precipice 2,000 feet high.

BEN MACDHUI, *mak do' e*, a peak in Scotland. See GRAMPIAN HILLS.

BENNETT, the family name of two of the most prominent and successful American journalists, father and son.

James Gordon Bennett (1795-1872) was the founder and editor of the New York *Herald* and originator of many of the modern devices employed in journalism. Foreign correspondents, financial articles, full reports of important speeches, prompt

and lively accounts of everyday events—these were unknown before his time, but other editors immediately adopted them.

Bennett was born at Newmills, in Scotland, and studied for the Roman Catholic priesthood, but the reading of Franklin's *Autobiography* interested him in America, and he emigrated in 1810. In Halifax, and later in Boston, he earned a scanty living on various journals; in 1832 he went to New York, and at intervals attempted to found a paper of his own. These efforts were without success until 1835; in that year there appeared the first number of the New York *Herald*.

It was issued from a cellar, a little four-page penny paper, but its editor was a born journalist and knew how to interest and hold the public, whether he always pleased or not. At first, he wrote the entire paper, and sold it as well, but soon he began to employ reporters and newsboys, and to introduce the features mentioned above. Financially, the paper was a great success, for it grew in size and prestige, and earned for its proprietor, in his later years, almost \$750,000 annually, a great sum in the earlier days of journalism. If Bennett himself was not always liked, if his opinions were not always respected, it was because he deliberately chose to increase the prominence and the circulation of his paper at the expense of his personal influence.

James Gordon Bennett, Jr. (1841-1918), his son, succeeded to the proprietorship of the *Herald*, but directed the affairs of the paper largely by cable, as he preferred to live in Paris. The chief innovation which he introduced was the publication of London and Paris editions of the *Herald*. Although he lived in Europe, Mr Bennett kept in intimate touch with his New York paper, sometimes cabling editorials on vital American topics. From his youth he was intensely interested in yachting, and won various races. Bennett, at his own expense, sent Henry M. Stanley to Africa to hunt for Livingstone, and he equipped the *Jeannette* for its Polar expedition. He was also one of the founders of the Commercial Cable Company. See STANLEY, HENRY M.

BENNETT, [ENOCH] ARNOLD (1867-), an English novelist and playwright, one of the leading writers of the modern period. Bennett was born at Hanly, one of the "Five Towns" which served so admirably as a background for his most famous series of novels. He studied at Newcastle Middle School and at the University of London; he was a lawyer's clerk, and then a magazine editor; and in 1900 he abandoned all other work to devote himself to writing.

His Literary Career. Bennett's novels of the "Five Towns" are remarkable examples of realistic



Photo Brown Bros

JAMES GORDON
BENNETT, JR

stories which picture minutely and truthfully the everyday lives of ordinary people in a commonplace setting. They reveal sure insight into human nature, and in spite of their unusual length and lack of sensational episodes, hold the reader's interest. The first of the series, *Anna of the Five Towns*, was published in 1902. Of the others, the most notable are *The Old Wives' Tale*; *Clayhanger*, *Hilda Lessways*, and *These Twain* (a trilogy); and *The Matador of the Five Towns*. *The Roll Call*, which appeared in 1919, is a story of the son of Hilda Lessways.

Bennett's other novels include *The Pretty Lady*, *Mr Prohack*, *Lilian*, and *Riceman Steps*. Among his plays are *Milestones* (with Edward Knoblock); *The Great Adventure*, based on the novel, *Buried Alive*; *Judith*, a modernized version of the Bible story, *Sacred and Profane Love*, *The Love Match*, and *Body and Soul*. Bennett also writes readable essays full of pungent comment. *How to Live on Twenty-four Hours a Day* is one of the most popular. He has also written many short stories.



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ARNOLD BENNETT

BENNETT, FLOYD. See POLAR EXPLO-
RATION.

BENNETT, RICHARD BEDFORD (1870-), a Canadian statesman who became Prime Minister of the Dominion in 1930. He was born in New Brunswick, was graduated from Dalhousie University, Halifax, and became a member of the bar in 1893. In 1897 he moved to Calgary, Alta., and in 1911 became a national figure through election to the Dominion Parliament. He was in the Meighen Cabinets in 1921 and 1926. In 1930 he became head of the Conservative Cabinet.

BEN NEVIS, *ben ne' vis*, is the tallest peak in Great Britain. See SCOTLAND (The Land).

BENNINGTON, BATTLE OF. See REVOL-
UTIONARY WAR.

BENNINGTON, VT. See VERMONT (back
of map).

BENTON, THOMAS HART (1782-1858), an American statesman, for thirty years United States Senator for Missouri and an influential factor in every important public question of his times. He was born near Hillsboro, N. C., but removed to Tennessee in his youth, and in 1811 was admitted to the bar in that state. While in the Tennessee legislature, to which he was elected in 1809, he became acquainted with Andrew Jackson, and in the War of 1812 he joined Jackson's staff. In 1813, a quarrel between these friends led to a duel, and both were injured. Not until years afterward were the two reunited in friendship.

After the war, in which he rose to the rank of lieutenant colonel, Benton moved to Saint Louis, where he practiced law and founded the *Missouri Inquirer*, a pro-slavery newspaper. When Missouri was admitted to the Union, in 1820, he was elected to the United States Senate, and then began his generation-long term of service. Intensely loyal to the West and its needs, he worked for the construction of a trans-continental railway and for the opening of the mineral lands to settlement. It was in connection with Jackson's fight against the United States Bank that Benton came most prominently before the public; by his ardent advocacy of a gold and silver currency he won the nickname of "Old Bullion." He also took an active part in the Oregon boundary discussion and the disputes over the annexation of Texas, and he approved of the Mexican War.

Having lost his seat in the Senate in 1850 through his opposition to the compromise proposed by Clay, he was elected two years later to the House of Representatives; but in 1854 he retired from public life and completed his great book, *Thirty Years' View*. This has become a valuable historical record. See MISSOURI (Government).

BENTON HARBOR, MICH. See MICHIGAN (back of map).

BENZENE, *ben' zene*, OR **BENZOL**, *ben'-zohl*, a colorless liquid, a little lighter than water, which has a pleasant odor and burns with a smoky flame. It is a product of coal-tar distillation. The lighting power of illuminating gas is due in a measure to the benzene it contains. Benzene readily dissolves fats, resins, rubber, sulphur, and iodine, and is very important because of the great number of compounds obtained from it. One of these, nitrobenzene, has the odor of bitter almonds; and is used to produce the flavor of almonds in essences and perfumery, but its chief use is in the manufacture of aniline, the basis of many beautiful dyes. Many derivatives of benzene occur in nature; they are in both the animal and plant kingdoms. For example, oil of wintergreen and thymol are derivatives of benzene.

Benzene was discovered by Michael Faraday in 1825. It is sometimes called *benzol*. It should not be confused with *benzine*, which is obtained from the distillation of petroleum. See ANILINE; BENZINE. T.B.J.



Photo Brown Bros

THOMAS HART BENTON

Chemical Formula. Benzene is a hydrocarbon, with the formula C_6H_6 . A molecule contains six atoms each of carbon and hydrogen.

BENZINE, *ben' zin*, or *ben' zeen*, a light, colorless liquid obtained in refining crude petroleum. It has an odor resembling that of kerosene; it is very inflammable, and it evaporates rapidly when exposed to the air. When mixed with air, its vapor is highly explosive, and serious accidents may occur if a lighted pipe or cigar or a lighted match or lamp is brought near benzine exposed to the air. Bringing it near a hot stove may also cause an explosion. Benzine is used for cleaning type and rollers of presses in printing offices; for removing dirt from clothing; for dissolving fats, oils, and resins; and it is combined with present-day gasoline as an internal-combustion fuel. Benzine is a mixture of hydrocarbon compounds of unknown constitution (compounds of carbon and hydrogen). See PETROLEUM. T.B.J.

BENZOATE, *ben' zo ate*, **OF SODA**, an organic salt or compound of soda and benzoic acid, used to a considerable extent in preserving food substances that are liable to decay or ferment from exposure to the air. The United States government allows benzoate of soda to be used in foodstuffs in quantities not larger than one-tenth of one per cent, careful investigation by the Referee Board of the Department of Agriculture having shown that such small quantities are not injurious to health. On account of the prejudice existing against it, however, many manufacturers of foods prefer to avoid its use. See ADULTERATION OF FOODSTUFFS AND CLOTHING. F.B.J.

BENZOL, *ben' zohl*. See BENZENE.

BEOWULF, *ba' o wolf*, an Anglo-Saxon epic, the most important relic of Old English literature. The only existing manuscript of this poem was written about A.D. 1000; it is preserved in the British Museum. The poem recounts the adventures of the hero Beowulf, especially his delivery of the Danish kingdom from the half-human monster Grendel and his equally formidable mother. It concludes with an account of the slaughter of a fiery dragon, and the death of the hero from wounds received in the conflict. The character of the hero is attractive through his noble simplicity and disregard of self. In imaginative quality and strength, this poem compares well with the epics of Homer. See EPIC.

BERBERA, *bur' bur ah*. See SOMALILAND.

BERBERS, *bur' burz*, a people of the Mediterranean coast of Africa, often mistakenly classed as Arabs. They are much like the Arabs in race and religion, but though the two often have a common government, they have not amalgamated throughout the centuries during which they have lived in close proximity. Both are Mohammedan, but the Berbers are Hamites; the Arabs, Semites. See SAHARA.

Berbers are often nearly black, with shiny brown hair. They are sparsely built, are not tall, but are strong and graceful. They cultivate the land after a primitive fashion, and raise sheep, goats, and camels. They usually live in tents, but are finding their way into towns in increasing numbers. There are three distinct types, known as Tuaregs, Kabyles, and Shilluhs. The Tuaregs are desert wanderers, dreaded by all peaceful tribes, and call themselves "Amazirg," meaning *the free*. The Kabyles and Shilluhs have been brought more under the influence of civilization. C.W.

Derivation. The name *Berber* and the word *Barbary* are probably derived from the Greek *Barbaros*, which meant *one who babbles*—hence, anyone who did not talk Greek; that is, a foreigner. Our word *barbarian* is from the same source. See BARBARIAN.

BERBICE, *bur bees'*. See BRITISH GUIANA.

BEREA COLLEGE. See KENTUCKY (Education).

BERENGARIA, *bair en ga' ri ah*, a steamship. See SHIP.

BERESFORD, *bair' es furd*, LORD CHARLES WILLIAM DE LA POER (1846-1919), a British admiral who rendered great assistance in raising the British navy to a high state of efficiency. Entering the navy in 1859, he grew into repute for his great ability and proved gallantry in action. At the bombardment of Alexandria in 1882, while in command of H. M. S. *Condor*, he distinguished himself and received special recognition. Entering Parliament soon afterward, he devoted his energies to forcing on the government a complete reorganization of the naval program. In this he was only partially successful, and he brought on himself the enmity of the Admiralty, or navy department. In 1906, however, he was appointed commander in chief of the Channel Fleet. In 1910, his term of command having expired, he was again returned to Parliament as member for Portsmouth. Owing to his advanced age, he did not take a command in the World War.

BERGAMOT, *bur' ga mol*, a name applied to several different plants. Oil of bergamot, extensively used in perfumery, is a greenish-yellow fluid obtained from the aromatic rind of the *bergamot orange* (*Citrus aurantium bergamia*). This is the fruit of a small citrus tree, grown commercially in Italy, and to some extent in the Gulf states and California as an



Photo: Brown Bros.

LORD BERESFORD

ornamental. In America, several pleasingly fragrant plants of the mint family are called bergamot, and the name is applied in Europe to various kinds of pears.

G.M.S.

BERGEN, *bair' gen*. See NORWAY (Cities).

BERGH, *burg*, HENRY (1820-1888), founder of two American societies that strive to prevent cruelty to children and to animals. He was born in New York City, and was educated at Columbia University. In 1864 he resigned from a position with the American legation at Leningrad, then known as Saint Petersburg, and soon after his return to America became interested in the work of mercy to which he devoted the rest of his life.

Though ridiculed and opposed, he succeeded in 1866 in having incorporated in New York the Society for the Prevention of Cruelty to Animals; two years before his death he saw this society established in thirty-nine states of the Union, and in Canada, Brazil, and Argentina. It has since spread over the civilized world. In 1874 he rescued a little girl from brutal treatment, which led to the founding of the Society for the Prevention of Cruelty to Children, now established very widely. These societies have back of them the powerful arm of the law, and they can bring about the arrest and punishment of persons who are inhuman in their treatment of children or animals. Bergh also invented artificial pigeons for sportsmen's practice in shooting, and he was the first to suggest the use of an ambulance for removing injured animals from the street. See CHILDREN, SOCIETIES FOR; CRUELTY TO ANIMALS.

BERGSON, *bairst' sun*, HENRI LOUIS (1859-), a French philosopher whose theories have wide recognition. Intuition and not intellect became to him the trustworthy guide; all former philosophies he rejected, at least partially, because intellect had too large a part in their composition. Time to him became the great reality, but he meant by time not just what is usually understood. In the ordinary sense of yesterday, to-day, and to-morrow, time does not exist, according to Bergson, for the past is gone, the present vanishes before one can say, "It is here," and the future no one can state positively will ever be. But time in the sense of pure duration, as one feels it in dreams, is the only sure foundation upon which life rests.



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HENRI BERGSON

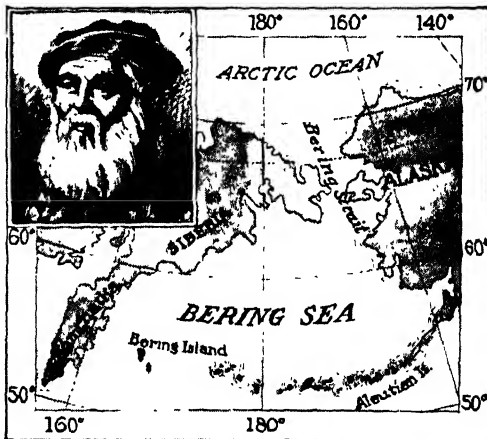
Bergson was born in Paris, of Jewish parentage. He studied in that city, and by 1900 had

become so well known as a teacher that he was appointed to the chair of philosophy in the Collège de France. Though he never sought popularity, his doctrines gained such a vogue that his lecture rooms were crowded constantly. In 1913 he visited the United States, and in 1914 was elected to the French Academy.

Bergson's Books. His publications include *Time and Free Will*, in which he presented the main principles of his philosophy; *Laughter*, an essay on the value of the comic; and *Matter and Memory*, a discussion of the relation between body and mind.

BERIBERI, *bair' ie bair' ie*. See NEURITIS; ADULTERATION OF FOODSTUFFS AND CLOTHING.

BERING, *be' ring*, SEA, that part of the North Pacific Ocean which lies between Alaska and the eastern coast of Asia. Bering Strait connects it on the north with the Arctic Ocean (and here the two continents are but thirty-six



IN HONOR OF VITUS BERING

The man, and the sea and strait named for him.

miles apart); on the south the narrow Alaskan peninsula and the Aleutian Islands separate it from the open Pacific. From north to south, it is about 1,000 miles in length, and from east to west, 1,500 miles; its greatest depth is 13,422 feet. During winter it contains floating and pack ice, and most of the year its waters are covered with a dense fog. Of its islands, by far the most important are the rocky and volcanic Pribilofs, home of the largest fur-seal colony in the world. Eighty per cent of all fur seals live in the Bering Sea.

Vitus Bering (1680-1741) was a famous Danish navigator who gave his name to these northern waters and islands. The courage which he displayed as captain in the navy of Peter the Great, during the Swedish wars, led to his being chosen to command a voyage of discovery in the Sea of Kamchatka. In 1728, and later, he examined the coasts of Kamchatka, Okhotsk, and the north of Siberia, and discovered the relation between the northeastern Asiatic and northwestern American coasts. Returning from

America in 1741, he discovered some of the Aleutian Islands. He was wrecked upon the island which bears his name, and died there.

Related Subjects. Though not intimately connected with the geography of this section, Bering Sea has a close relation to the following topics.

Alaska
Bering Sea Controversy

Pribilof Islands
Seal

BERING SEA CONTROVERSY, a dispute between Great Britain and the United States which centered about the valuable seal fisheries on the Pribilof Islands. Beginning in 1867, the United States had carefully regulated by license the killing of seals on the Pribilofs, the location of the largest seal rookery in the world. After 1886, unlicensed fleets of Canadians and Americans were killing the seals during feeding time, when they were more than three miles from shore, beyond the jurisdiction of the United States government. Many of the animals killed were females, and it became apparent that the herd under such treatment would soon be exterminated.

In order to restrict unlicensed killing, the United States set up a claim that Bering Sea was a closed sea, that is, subject to the exclusive jurisdiction of the United States. This was protested by Great Britain, and by a treaty in 1892 the question was referred to arbitration. The tribunal, which consisted of one Englishman, one Canadian, two Americans, and one representative each of France, Italy, Sweden, and Norway, reported in 1893 a decision which was generally unfavorable to the United States. However, it established a closed season from May 1 to July 31, forbade the killing of seals in the open sea within sixty miles of the Pribilofs, and prohibited explosive weapons. These restrictions proved ineffectual, but since that time Canada, Japan, and the United States have joined in an agreement to protect the herds. See **SEAL**, for added information; also **PRIBILOF ISLANDS**.

BERKELEY, *burk' lie*, CALIF., a residential city near San Francisco, noted as the seat of the University of California. It is situated in Alameda County, near the eastern coast of San Francisco Bay. Adjoining it on the south is Oakland, the county seat. The Southern Pacific and Santa Fe roads provide steam railway accommodations, and electric and ferry lines connect with San Francisco, seven miles across the bay. Population, 1930, 81,543.

Berkeley has a fine location on elevated land commanding views of San Francisco Bay and the Golden Gate; its site and its attractive homes and colorful vegetation make it one of the most charming residential communities in the state. Besides the state university, described in the article **CALIFORNIA**, the city has three theological seminaries, the State Agricultural and Mechanical College, the California School of Arts and Crafts, the State Institution

for the Deaf, Dumb, and Blind, Anna Head School, Cora Head Institute for Creative Education, and Saint Joseph's Academy.

Industries. The leading manufactures include refined petroleum, coconut oil, soap, health foods, airplane propellers, and ink. Fruit drying and canning is also carried on, and the fisheries are important.

History. The site which Berkeley occupies was a farming district until it was chosen as the seat of the university. It was settled in 1808, and was incorporated as a town in 1878. The town was named in honor of George Berkeley, bishop, philosopher, and author, on account of his famous line, "Westward the course of empire takes its way." In 1923 the city adopted the city-manager form of government. In the same year, in September, the city suffered from a very disastrous fire.

BERKELEY, SIR WILLIAM (1610-1677), a colonial governor of Virginia whose faithlessness and obstinacy in dealing with the uprisings of Indians in 1676 caused the revolt known as Bacon's Rebellion (which see). He was born near London, was educated at Oxford, and became governor of Virginia in 1641. When Cromwell gained control of the British government, Governor Berkeley offered an asylum in Virginia to loyalists, and he kept the colony loyal to the king until 1652. In that year he was compelled to resign, but he was again appointed governor in 1660.

His second term of office was marked throughout with dissatisfaction, and his harshness in punishing the leaders in Bacon's Rebellion displeased even Charles II, who said, "The old fool has taken more lives in that naked country than I did for the murder of my father." Berkeley was recalled to England by the king in 1677, and he died soon after reaching home.

BERKSHIRE, *burk' shir*, **HILLS**, one of the most beautiful resort regions of the Eastern United States. These hills are not a separate range, but are a continuation into Berkshire County, Mass., of the Green Mountains of Vermont. They attain in Mount Greylock a height of 3,535 feet, the greatest altitude in the state. The wooded slopes are cut by mountain streams, which find their way to the Hoosac, the Housatonic, and the Deerfield rivers. Quaint inns are located in picturesque spots. The towns of Pittsfield, Stockbridge, Lenox, and Great Barrington, besides various summer resorts, are situated in this region. The Hills provide one of the most delightful motoring trips in the eastern part of America, and they are visited by thousands of tourists every year.

BERLIN, CONGRESS OF, an assembly of representatives of the powers of Europe, which emphasized the fact that Turkey in Europe was not to become the prey of any one nation, and that questions relating to it were to be settled in conference. By victories in the Russo-Turkish War of 1878, Russia gained the power practically to dictate terms of peace to Turkey,

and the Treaty of San Stefano plainly looked toward the annihilation of Turkey in Europe. This roused the jealousy of the other powers, and in June, 1878, representatives from Germany, Austria, France, England, Italy, Russia, and Turkey met at Berlin to modify the objectionable terms. They did their work thoroughly, denying Russia much which the Treaty of San Stefano had conceded.

That treaty had created Bulgaria and Eastern Rumelia an independent state; however, the Congress of Berlin permitted self-government to Bulgaria, under Turkish auspices, but made Eastern Rumelia merely a Turkish province. Bosnia and Herzegovina remained

nominally under Turkish sovereignty, but Austria-Hungary was made administrator of their affairs; Montenegro, Serbia, and Rumania were confirmed in their independence, and Great Britain was made practical owner of Cyprus. All in all, the Congress of Berlin did much to make the map of Europe what it remained throughout the rest of the century. It was disturbed but little until the Balkan Wars of 1912 and 1913, although in 1908 Bulgaria proclaimed itself a sovereign state, and Austria annexed Bosnia-Herzegovina.

Related Subjects. The reader is referred in these volumes to RUSSO-TURKISH WARS and the countries named in the last paragraph above



BERLIN, GERMANY. From almost unknown beginnings in the Middle Ages, Berlin has grown to be the largest city on the continent of Europe, the second largest among all European cities, and the third largest in the world. London and New York alone surpass it in population. At the time of the census of 1925, the population was reported as 4,013,588, including such suburban centers as were united with the metropolitan administration in 1920, for the better control of streets, water supply, etc. In most respects, these suburbs retain their own local government. Greater Berlin has an area of 339 square miles.

Now the capital of the republic of Germany, Berlin was formerly the capital of the kingdom of Prussia, and from 1871 to 1918, capital of the German Empire. The city lies in the same latitude as Edmonton, Alberta, and Southern Labrador, but its climate and average temperature correspond to that of New York. It is as far north of the equator as the Strait of Magellan is south of it. It is 180 miles from Hamburg and eighty-four miles from Stettin, and has water communication with both ports through the Elbe and the Oder rivers and the canals connecting them.

Famous Buildings and Monuments. Berlin, like all other great capitals of Europe, is famous for its imposing buildings, beautiful parks, and splendid avenues. The center of the social and political life is Unter den Linden, one of the

most famous streets in the world. At the eastern end of this promenade is the palace formerly occupied by Emperor William II; it is a rectangular brown sandstone building with over 600 rooms. At the western end is the famous Brandenburg Gate, surmounted by the bronze quadriga, or chariot of victory, which Napoleon carried off to Paris in 1807. Between the palace and the Brandenburg Gate, a distance of less than a mile, are the University of Berlin, the great library which was known in the days of the empire as the royal library and is still so designated, the opera house, the palaces of former emperors William I and Frederick III, the finest hotels, and the most elegant shops.

Of all the public buildings, by far the most magnificent is the Parliament building (Reichstagsgebäude), designed in a modified classic style. Though unattractive in some of its details, it is a strikingly powerful architectural conception. Also notable is the cathedral, dedicated in 1905. It is in the Italian Renaissance style, with a dome rising to a height of 380 feet. Almost equally conspicuous is the Emperor William Memorial Church, completed in 1895 as a memorial to the "Old Kaiser," as the Germans still affectionately call William I, the grandfather of the last of the Hohenzollerns.

Berlin has hundreds of monuments, in all parts of the city. Perhaps the most famous is Rauch's equestrian statue of Frederick the Great, which is on Unter den Linden, near the

palace. Near by is the national monument of Emperor William I. In the Königs Platz, the great square in front of the Reichstag building, is the Victory Column, erected to celebrate the victories of the Franco-German War of 1870-1871. Statues of Bismarck, von Moltke, and von Roon stand not far away. From the Victory Column it is but a step to the Avenue of Victory (Sieges-Allee), a promenade adorned with statues of the thirty-two Hohenzollerns who ruled in Prussia before the formation of the German Empire. This statuary was a gift of Emperor William II to the city.

Intellectual and Artistic Life. While the city, the kingdom of Prussia, and the empire all spent money freely to make Berlin outwardly a great capital, people of ability have been drawn to it to make it a capital in other respects. Its university and schools, its art galleries, its orchestras, and its theaters are newer than those of cities like Munich, Dresden, and Leipzig, but are crowding their older rivals for first place. The University of Berlin, though founded as late as 1810, ranked first among German universities in number of students before the World War. After the war, it fell below Munich for a time, but later recovered first position.

In painting and sculpture Berlin holds a leading place. Its former royal museums and the national gallery are filled with art treasures. Museums and galleries in other cities are richer in special limited fields, but few offer a greater variety of excellence. In music, Berlin does not yet rival Leipzig, but its conservatory and philharmonic orchestra have great influence. In theatrical affairs, Berlin takes first place, not only in the production of modern German dramas, but also in translations from Molière, Shakespeare, Ibsen, and George Bernard Shaw.

Commerce and Industry. The geographical position of the city makes it a natural market and distributing point for the agricultural regions of Prussia, Austria, and Russia. It is the hub of the railway systems of North Germany; the great trunk lines provide communication in every direction. Berlin possesses one of the greatest airports in Europe, and airplanes connect daily with all the capitals of the continent.

Commerce is in cattle, wool, lumber, iron, coal, and grain. Berlin is the center for trade in grains, its position corresponding in this respect to Chicago in the United States. It is also the chief market for speculation and legitimate transactions in stocks and bonds, and is the financial center of the German republic.

More than one-half of the city's working population is engaged in manufactures. The transformation of iron and steel into machinery is, perhaps, the greatest industry, no fewer than a hundred large firms being engaged in this branch alone. Railway supplies, bicycles, steel pens, electrical supplies, and sewing ma-

chines are among the products which make the city a great factory center. In volume of production, Berlin's breweries now rival those of Munich. The city is also an important publishing center.

Government. The government of the city under the republic is partly under the control



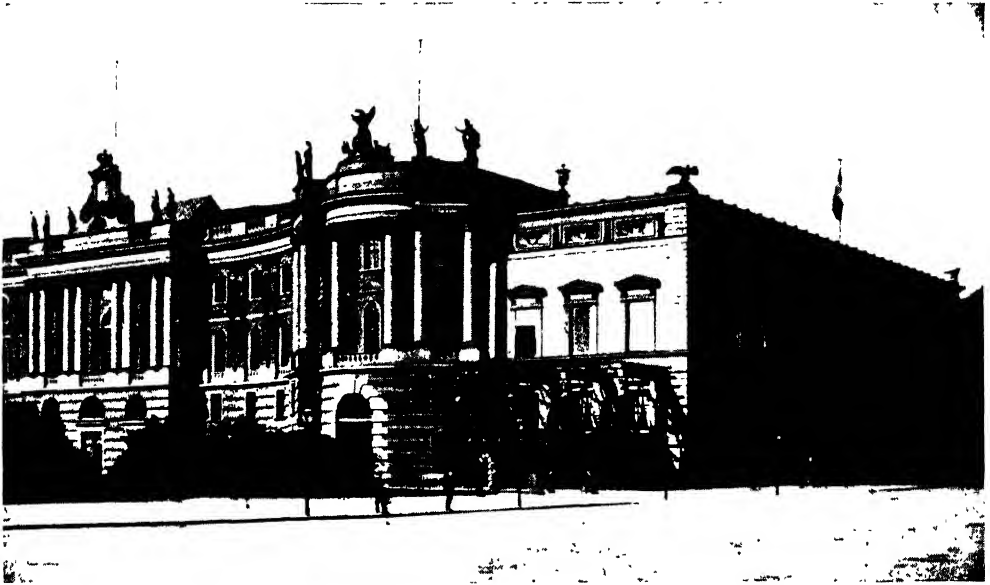
Photo O R O C

A MILE OF BUSTS

The roadway on the route to Sans Souci Gardens, near Berlin, is lined with busts of famous Germans

of the Prussian Minister of the Interior, and partly, of the local civil authorities. All police functions, including the regulation of building, crime, passports, and the prevention of fire, belong to a branch of the Interior Department. The civil authorities have jurisdiction over the water supply, street lighting and cleaning, drainage, and the care of the sick and the poor. There is an elected common council of 144 members, the heads of the departments form the Stadtrat; its thirty-two members are elected by the council, but have to be approved by the president. The common council elects the burgomaster (mayor) and the chief burgomaster, who do not have to be residents of Berlin at the time of their election. They are usually, in fact, men who have distinguished themselves as mayors of other cities. Under the republic many minor details of government have been changed to conform to republican necessities or preferences.

History. Of Berlin's beginnings, nothing definite is known, but by the fifteenth century it was an important community in the mark of Brandenburg. About 1500 it became the official residence of the margraves of Brandenburg, but it was practically wiped out during the Thirty Years' War. Its renewed prosperity



FORMER PALACE OF WILLIAM II, LAST OF THE HOHENZOLLERNS

was due to the Great Elector, Frederick William. By his order, public buildings and private dwellings were rebuilt, new suburbs were laid out, and strong fortifications were added. He also laid the foundation for its future greatness by constructing a canal to connect the Spree and the Oder rivers. At his death, in 1688, Berlin had a population of 20,000 people, compared with 6,000 in 1648.

Under the kings of Prussia, the successors of the Great Elector, the growth and beautification of the city continued. Frederick the Great gave special encouragement to the manufactures of silk and cotton; and Berlin, formerly little more than a small garrison town, began to take on the character of an industrial center. During the nineteenth century, it made enormous strides, especially after it became the capital of the German Empire in 1871. Most of Berlin, in fact, is of nineteenth-century construction; the important buildings which are older total fewer than a dozen.

As the capital of the new empire, Berlin presented a sorry spectacle in 1871. Its sanitary conditions were worse than those of any other large city in Europe. Many of its streets were unpaved, and the cobblestones on the remainder were but a slight improvement. Open sewers and drains, public pumps, and underground tenements were characteristic. To-day this is all changed, partly because the state and the people have worked together to make it a great capital. More than anything else, the new national spirit of the German nation made this result possible in a short time.

Berlin became one of the cleanest and most

healthful cities in Europe, but after the flight of the emperor in November, 1918, it entered upon a period of stress. The city suffered severely from the effects of the revolution which accompanied the change in government. Fighting among factions for control took a heavy toll of deaths; gunfire damaged stately government buildings. During 1921 and 1923 there were numerous strikes and food riots; outbursts of discontent were frequent. Crowded housing conditions added to the confusion. So great was the shortage up to 1921, due to the establishment of new government departments in Berlin, that it was necessary to erect special offices under municipal supervision. Gradually order was restored. In January, 1923, a new underground railway was opened as a continuation of the Hamburg line. See GERMANY.

University of Berlin, an institution of learning, which, though it does not date back to the Middle Ages, as do so many of the great European universities, has attained a commanding position among the universities of the world. Plans for founding it were begun during the latter part of the eighteenth century, but the Napoleonic struggle interfered, and not until 1810 was it finally established. Its full name is the Royal Frederick William University of Berlin, for it was founded during the reign of Frederick William III of Prussia, and named for him. After somewhat more than a century of existence, it stands as the most prominent university of Germany, and during its history it has numbered many illustrious scholars among its instructors. Several American universities have exchanged professorships with the University of Berlin. Attached to the university is the Royal Library, one of the largest libraries in the world

Outline and Questions on Berlin

I. Size and Location

- (1) Rank among world's cities
 - (a) City proper
 - (b) Greater Berlin
- (2) Population
- (3) Position with reference to other large cities

II. Description

- (1) Streets
 - (a) Unter-den-Linden
- (2) Public buildings
- (3) Monuments
- (4) Educational institutions
 - (a) University of Berlin
- (5) Museums and galleries
- (6) Drama

III. Commerce and Industry

- (1) Communication
 - (a) Aviation
 - (b) Railroads
- (2) Trade
- (3) Manufactures
 - (a) Machinery
 - (b) Brewing
 - (c) Other products

IV. Government

- (1) Functions of the Department of the Interior
- (2) Local officials
 - (a) Mayors
 - (b) Council

V. History

- (1) Early history
- (2) The Great Elector
- (3) The city's newness

Questions

Has Berlin kept pace with other cities in aviation?

During what century did the city have its greatest growth?

What is the most noted street in Berlin?

How large a proportion of the people earn their living from manufactures?

In what English dramatists are the people especially interested?

What change has there been in the sanitary conditions of the city since it became the capital?

What place is as far from the equator on the south as Berlin is on the north?

With what American city may it be compared in respect to its trade in a great commodity?

What is the most imposing building?

How did the city commemorate the German victories in the Franco-German War?

What ruler laid the foundation for the greatness of Berlin?

What are Berlin's air communications?

BERLIN, IRVING (1888-). The real name of this Russian Jew who lifted himself from a life of abject poverty on the East Side of New York City to riches and to world-wide fame, is ISRAEL BALINE. He is a successful and prolific writer of popular songs, and a master of syncopation. In 1892, when Israel was four years old, the village in Russia which had been the family home was destroyed by fire, and the parents and eight children emigrated to New York. Before long the little boy began to sell newspapers in the poorer Jewish sections of the city. Possessed of a clear soprano voice, he soon attracted attention by singing on street corners and in saloons. This modest success led to his appearance on the stage of the Century Theater, where in one night, an army song, "Poor Little Me. I'm a K. P.," spread his fame over the city.

His musical talent developed quickly, and his compositions, always of a popular nature, appeared in rapid succession. It is a remarkable fact that he can neither read music nor transcribe it. He composes at the piano, which in his rough-and-ready youth he learned to play "by ear"; when an air is improvised to his satisfaction, his assistants transfer the tune to the staff.

In 1926 Berlin contracted a runaway marriage with Miss Ellin Mackay, daughter of Clarence Mackay, president of telegraph and cable companies. Miss Mackay became his second wife; in February, 1913, he had married Miss Dorothy Goetz, who died five months later.

His Compositions. Not all of the hundreds of songs and instrumental selections that he has written can be named here. Two of his earliest popular numbers were *Alexander's Ragtime Band* and *Oh, How I Hate to Get Up in the Morning*. Among more serious and sentimental titles are *When I Lost You, Remember, All Alone, Don't Wait Too Long, When I Leave the World Behind, Always, and The Song Is Ended, but the Melody Lingers On*. He composed the score for the plays *Watch Your Step, Music Box Revues* (three), *Stop! Look! Listen!*, some of the *Zeigfeld Follies*, and with Victor Herbert, *The Century Girl*.

BERLIN, N. H. See NEW HAMPSHIRE (back of map).

BERLIN DECREE. See MILAN DECREE; CONTINENTAL SYSTEM.

BERLINER, *bair le' nur*, EMILE (1851-1929), the inventor of the telephone transmitter, or microphone, and of the method of reproducing sound utilized in one style of talking machine. He was born and educated in Germany; he emigrated to the United States in 1870, and nine years later became chief instrument inspector for the Bell Telephone Company. In addition to the microphone, invented in 1877, he discovered several other means of improving the telephone service, the patents for which became the property of the Bell Company.

Berliner's inventions in connection with the talking machine date from 1887. In the old-style machine the sharp-pointed instrument, known as the stylus, moved through a groove of varying depth, and the reproduction of sound was inaccurate and unsatisfactory. Berliner conceived the idea of using for the record, instead of a cylinder, a disk on which a horizontal record of uniform depth but varying direction should be cut. In reproducing the sound, the stylus, as the invention has developed, is guided by the groove through which it moves, and not by a feed screw, as formerly. He also invented and perfected the modern method of making duplicates of disk records, and saw his prediction fulfilled that famous singers would some day earn great sums of money by having their voices recorded. The talking-machine company which owns his devices spent \$500,000 in sustaining the patents. See PHONOGRAPH.

BERLIOZ, *bair le oze'*, HECTOR (1803-1869), one of the most intellectual and poetical composers of music that France has produced. He studied at the Paris Conservatory, where, in 1830, his cantata *Sardanapalus* won first prize—expenses for foreign travel. Thereafter he gained a wide reputation for the composition of so-called *program music*, in which definite ideas are realistically expressed by the music; and for his masterful work in the arrangement of orchestra music, in which he laid the foundation for Wagner, Liszt, and Richard Strauss. His symphonies, *Harold in Italy* and *Romeo and Juliet*; his opera, *The Trojans*; and his celebrated *Tel Deum* are now considered masterpieces, though the composer was little appreciated in his own day.



Photo Brown Bros
HECTOR BERLIOZ

BERMUDA GRASS. See GRASS (illustration).

BERMUDA ISLANDS, a group of 360 islands and islets in the Atlantic Ocean, midway between the West Indies and the North American coast. By steamer, they are forty-eight hours distant from New York City. Twenty of the group are inhabited, and they form one of the most important of British possessions in the Atlantic. They are the most northerly islands in the world entirely of coral formation, and unlike other coral islands, they contain hills and ridges which rise to a height of nearly 300 feet. The largest islands are Bermuda (named after Juan Bermudez, who discovered the group in 1515),

Saint George, Ireland, and Somerset. The total area is 12,000 acres, of which Bermuda contains 9,000 acres.

The climate is especially pleasant and healthful. In winter, frost is unknown, and the



THE FORM OF THE BERMUDAS

Hamilton, the capital, and sailing directions to New York and Europe

temperature seldom falls below 50° F. The sharp contrast between summer and winter on the mainland is here entirely absent, for in summer the heat is seldom greater than 87° F., and delightfully cool breezes blow from the sea. The Bermudas have long been regarded as almost an ideal resort, and are visited both summer and winter by great numbers of people. The scenery delights the eye; there are many beautiful roads, but no automobiles are allowed on any of the islands.

Ireland Island is an important British naval station; it is the winter headquarters of the British North Atlantic fleet. A small garrison is permanently maintained. The capital, Hamilton, on Bermuda, has a population of 2,600.

The islands were first settled in 1600 by Sir George Somers, supported by a number of colonists from Virginia. They are now administered by a governor, assisted by two councils of appointed members, and an assembly of thirty-six members elected by the people. Civil population, 21,000, of whom 7,000 are whites. See illustration, page 719.

BERMUDEZ, *bair moo' daze*, an asphalt lake belonging to Venezuela (which see).

BERMUDEZ, JUAN. See BERMUDA ISLANDS.

BERN. See SWITZERLAND (The Cities).

BERNARD, *bur' nard* or *bur nahrd'*, SAINT (1001-1153), one of the most influential Roman Catholics of the Middle Ages, whose life and character, to the people of his own day, were the expression of their highest ideals. He was born in Burgundy, France, and at the age of twenty-two became a monk of the Cistercian Order. Soon after, he founded the famous



THE GOVERNMENT BUILDING AT HAMILTON

Photo U & U

Cistercian monastery at Clairvaux; he became its first abbot, and it was to him that the order owed its wonderful growth and influence.

Saint Bernard dominated the affairs of the Church for the rest of his life, and in 1128 gave the rules of government to the newly founded Order of Knights Templars. His stirring eloquence inspired the Christians to undertake the second Crusade (see CRUSADES), but of the innumerable host that marched to the holy war only a remnant ever returned; his disappointment over this failure was a blow from which he never recovered. Martin Luther's words concerning him are famous: "If there ever lived a God-fearing and holy monk, it was Saint Bernard of Clairvaux."

Hymns That Live. He wrote a large number of epistles, sermons, and treatises, and his beautiful hymns, *Jesus, the Very Thought of Thee* and *O, Sacred Head, Now Wounded*, are sung in Christian churches to-day.

BERNHARDT, ROSINE, known as **SARAH** (1845-1923), one of the world's greatest actresses, who through sixty years of almost uninterrupted work retained unimpaired her vitality and her artistic gifts. The impression that her art made on people was expressed in the name so frequently applied to her—"the Divine Sarah."

She was born in Paris, and though of Jewish descent, was baptized with Christian rites, in accordance with her father's wish, and spent the early years of her life in a convent. At the Paris Conservatory, where she studied from 1858 to 1862, she won second prizes for tragedy and comedy, but her first appearance on the stage in 1862, in a small part in Racine's *Iphigenia*, was in no way exceptional. After an unsuccessful trial of burlesque, she turned to serious parts. As Cordelia in *King Lear*,

as the queen in Hugo's *Ruy Blas*, and as Zanetto in *The Passer-by*, she made it known to the theatrical world that a new actress of rare promise had appeared.

Joining the company at the French Comedy Theater in 1872, she achieved a series of triumphs, one of her most remarkable performances being the rôle of Dona Sol in Hugo's *Hernani* (1877). In 1879 she acted with great success at the London Gaiety Theater. On her return to Paris, she suddenly terminated an engagement with the management of the French Comedy Theater, a breach of contract which cost her \$20,000. During 1880 and 1881 she toured Denmark, Russia, and America, including in her repertoire the famous



Photo U & U

SARAH BERNHARDT

Camille of Dumas. In 1882, in London, she married a Greek actor, Jaques Damala, from whom she was separated a year later. Her next appearances on the stage were in a number of plays by Sardou, who wrote for her especial use *Theodora*, *La Tosca*, and *Cleopatra*.

American Tours. Bernhardt's first American tour began in 1880, and she was everywhere received with great enthusiasm. Between 1891 and 1893, she visited North and South America, Australia, and the chief countries of Europe, and on her return to Paris in 1893 she became manager of the Theater of the Renaissance. Five years later, she established the Sarah

Bernhardt Theater, of which she retained management up to the day of her death, in March, 1923. She revisited America in 1900, 1911, and 1913, the first of these tours being devoted to Rostand's *L'Aiglon*, with the famous Coquelin in the leading male rôle. Her 1913 tour consisted of vaudeville performances of single acts from a number of plays, and the presentation of a new one-act play entitled *A Christmas Night During the Reign of Terror*.

During the American engagement of 1913 she suffered from an accident which later developed into blood poisoning and made necessary the amputation of a leg in February, 1915. She learned to walk on an artificial leg, and resolutely returned to activity, in spite of advancing years. In 1914 she appeared in a moving-picture production of *Queen Elizabeth*, which she said gave her great joy because it would make her live a thousand years.

In October, 1916, this great actress returned to the United States to appear during the following winter in the principal cities. She was accorded the greatest reception which ever marked her American experiences.

Her services to America have been aptly summarized by a writer in these words:

Of French literature, we knew nothing. She opened that great treasure-house to us. She made living realities of great dramatists and created an intellectual sympathy between France and America.

The countries of Europe which the great Bernhardt visited paid her a like tribute.

A number of peculiar mannerisms and oddities were associated with her acting, but these gave her individuality without detracting from the flawlessness of her art.

BERNSTORFF, JOHANN HEINRICH, Count (1862-), a German diplomat, in 1908 appointed ambassador to the United States. His father, Count Albrecht Bernstorff (1800-1873), was also prominent in German diplomacy, and was for many years ambassador at London, where his son was born. After serving in the army for eight years, the son entered the German diplomatic service in 1880 as an attaché of the embassy at Constantinople. Thereafter he served in various diplomatic capacities at Belgrade, Dresden, Munich, Leningrad (then Saint Petersburg), and London, and was German consul-general in Egypt for two years prior to his appointment as ambassador to the



Photo U & U

COUNT VON BERNSTORFF

United States. In this position he conducted many delicate negotiations with America after the beginning of the great war in Europe, and, especially as he had an American wife, he was believed to be honestly friendly toward the United States. However, it soon developed that he was the virtual head of the intricate German spy system in America, and was grossly abusing the privileges of his office. The American government sent him home in February, 1917. He was soon again in the diplomatic service as ambassador to Turkey, where he remained until the German Empire crumbled. In 1921 he published *My Three Years in America*. See **WORLD WAR** (America in the War).

BERTILLON, *bair' te yon'*, **SYSTEM**, a system devised to identify criminals, named after its inventor, Alphonse Bertillon. Its object is to arrive at so complete a description of a criminal that, no matter how he may disguise himself in the future, his recognition and identification will be certain when the Bertillon tests are applied. The means of identification are based on measurements of certain parts of the body and a description of the general appearance of the individual. It is known that the bones of adults over twenty years of age do not change, and that the measurements of any two persons are not exactly similar. In the Bertillon system, the following metric measurements of prisoners are taken:

Body	Height standing, height sitting, inches from finger tips, with arms outstretched
Trunk	Height, sitting
Head	Length and width, length and width of right ear
Limbs	Length of foot, left middle finger, little finger, and forearm

The system has proved successful, and its efficiency has been greatly increased by the inclusion of thumb and finger prints, which by themselves are considered an almost infallible means of identification. See **FINGER PRINT IDENTIFICATION**

Alphonse Bertillon (1853-1914), the inventor of the system named after him, was born in Paris. After years of study devoted to criminology, he became the head of the identification department of the police of Paris. In recognition of his services, he was made Chevalier of the Legion of Honor. He was a prolific writer on criminology and kindred subjects, on which he was regarded as the world's chief authority.

BERWICK, PA. See **PENNSYLVANIA** (back of map).

BERYL, *bair' il*, a mineral which occurs sometimes in great six-sided prisms and sometimes in smaller crystals; it is among the most valuable of the precious stones. Some beryls are bright green, and are called *emeralds*; some are a bluish sea-green, and are known as

aquamarines; and some are light blue, pink, or yellowish (see **AQUAMARINE**; **EMERALD**). Madagasgar has both pink and yellow beryls. The scholars of the Middle Ages credited the beryl with many virtues, one learned writer declaring that it "rendered the wearer unconquerable and at the same time amiable, while his intellect was quickened and he was cured of laziness." For a long time the beryl was the birthstone for October, but it has been replaced in that connection by the opal and tourmaline.

T.B.J.

Chemical Formula. The formula for beryl is $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$; that is, a molecule contains three atoms of beryllium, two of aluminum, six of silicon, and eighteen of oxygen.

BESANT, *bes' ant*, ANNIE (1847-), a leading figure in the theosophist movement, was born in London. When a young woman, she adopted free-thought, and once was arrested on a charge of publishing blasphemous material in connection with a defense of her belief. An increasing inclination toward socialism alienated her from many of her associates, and she completely broke with the past in 1899 in an abrupt adherence to the Theosophist Society, becoming an earnest pupil of Madame Helena Blavatsky (which see). A large part of her life thereafter was spent in India. She founded the Indian Home Rule League, and was a powerful member of the Indian National Congress. She consolidated the cult of theosophy in India, and was recognized for years as its foremost living leader. See **THEOSOPHY**; **OCCULT**.

BESANT, *be zant'*, SIR WALTER (1836-1901), an English novelist and critic. His most notable work, *All Sorts and Conditions of Men*, gives a clear picture of the sordid life and surroundings of the people of London's East End. This book was the inspiration of the People's Palace in Mile End Road, London, and placed the author among the social reformers of his day. Like Dickens, he tried to arouse public sympathy for the poor and oppressed.

Besant was born at Portsmouth, and was educated at King's College, London, and at Cambridge. After teaching mathematics for a few years, he formed a literary partnership with James Rice (1843-1882). Among the novels which they produced together are *Ready Money Moriboy*, *The Golden Butterfly*, and *The Seamy Side*. After the death of Rice, Besant wrote a number of popular novels, including, besides his masterpiece mentioned above, *Dorothy Forster*, *Armored of Lyonesse*, and *Beyond the Dreams of Avarice*. He was the founder of the Society of Authors, a trade-union of writers, and the editor of the *Author*, the publication of the society. He was knighted by Queen Victoria in 1895.

BESSARABIA, *bes a ra' bih ah*. See **RU-MANIA** (Historic Provinces); **RUSSO-TURKISH WARS** (Nineteenth Century).

BESSEMER, *bes' e mur*, ALA. See **ALABAMA** (back of map).

BESSEMER, SIR HENRY (1813-1898), an English inventor and engineer, celebrated for his discovery of the Bessemer process of making steel. This made it possible to roll steel into shape without hammering it (see **IRON AND STEEL**). It is true that the process was known to an American named William Kelly eight or nine years earlier, and American patents were granted to Kelly, yet it was from Bessemer that the world learned of it. Both inventors were first ridiculed by iron-makers, but Bessemer's superior resources and business ability enabled him to put his ideas into successful operation. His experiments and discoveries relating to steel and iron are best known of his many activities, but his work in many other fields also brought him fame. He discovered a new process of making bronze powder; he made several important improvements in type-casting machinery, and he invented a method, still in use, for compressing the graphite used in making lead pencils. Bessemer was knighted by Queen Victoria in 1879.

BETA, *be' tah*, RAYS. See **RADIOACTIVITY**.

BETEL, OR **BETLE**, *be' t'l*, the name of two plants common in Asia—the betel palm and the betel vine. The betel palm, the commonest and most important of the *Areca* palms (see **PALM**), is a graceful tree, usually forty to fifty feet high. Its fruit, the betel nut, is about the size of a hen's egg, and has a fibrous shell, within which is enclosed the betel nut, which is chewed by the natives of the Orient. The name *betel* has been given to this nut and the tree which bears it only because of the association with the *betel vine*, to which the name originally belonged. This is a creeping plant of the pepper family, the leaves of which have a sharp, stinging taste. A number of different plants nearly related to the peppers, the leaves of which have similar properties, are also extensively cultivated in the East, and are sometimes called betel. (See next page.)

B.M.D.

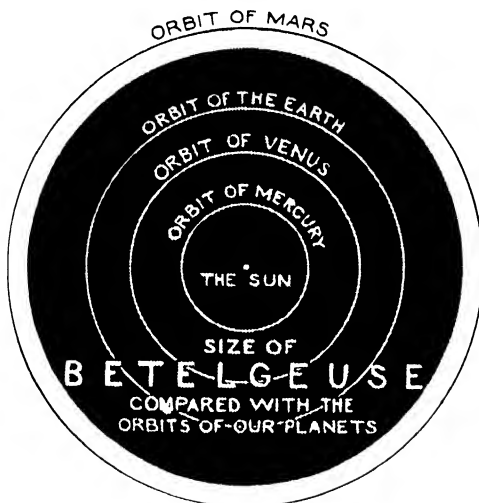


BETEL PALM
(a) Nut; (b) cross section of nut; (c) flower.

Betel Chewing. In the East Indies, practically every native carries a betel box. It is rare, indeed, to find a Malay of either sex who is not addicted to betel chewing, but it has never spread to any extent among other peoples. The seeds of the betel nut are boiled, cut into slices, dried in the sun, and then grated upon fresh betel-vine leaves which have been smeared with quicklime. The whole mass is rolled into a pellet and chewed; and, while it is far too biting for pleasure to a person not used to it, the Malays find so much satisfaction in it, and chew it so continuously, that the proper handling of betel is an important part of the etiquette in every ceremonial meeting. Betel tinges the saliva, gums, and lips a brick red, blackens the teeth, and causes them to decay rapidly.

Classification. The botanical name of the betel palm is *Areca catechu*; that of the vine is *Chavica betel*.

BETELGEUSE, *bet el guz'*, a first-magnitude star in the constellation Orion (which see). Its relative location may be seen in the diagram entitled *The Heavens in Autumn and Winter*, in the article ASTRONOMY. When measured with the interferometer at Mount Wilson Observatory, near Pasadena, Calif., Betel-



THE ALMOST INCOMPARABLE STAR

geuse was found to have a diameter of 235,000,000 miles. Only Antares, Mira, and possibly Alpha Herculis, among the stars of our stellar universe, are known to be larger.

Betelgeuse has a deep-red color, with a tinge of orange, indicating that it is in the early stages of development. Its brightness is also variable. Betelgeuse is believed to be not nearer to earth than 190 light years. This star is in the northern hemisphere, though part of Orion is in the southern. The constellation may be seen to good advantage in the southern sky at nine o'clock in the evening, during the month of February. See INTERFEROMETER; STAR (How Star Distances May Be Determined).

F.B.L.

BETHANY COLLEGE. See WEST VIRGINIA (Education).

BETHEL, a city of antiquity, in Palestine (which see).

BETHEHEM, the city in which Christ was born. See PALESTINE.

BETHLEHEM, PA., an historic borough in Northampton County, a center of the steel industry, and the headquarters in America of the Moravian sect. It is in the heart of the Lehigh Valley, on the Lehigh River and Canal, fifty-six miles northwest of Philadelphia, and eighty-nine miles from New York City. Population, 1930, 57,773.

The city was founded in 1741 by Moravians who were religious exiles from Bohemia and Moravia, and many of the old buildings of the first village are standing to-day. A college, theological seminary, preparatory school, and a seminary for women are maintained there by the sect. The Moravian Seminary and College for Women is the continuation of the oldest boarding school for girls in the country. The former South Bethlehem, since 1917 a part of Bethlehem and connected with it by bridges, is the seat of Lehigh University.

West Bethlehem was annexed to Bethlehem in 1904. At the former place was located a general hospital of the Continental army (1776-1778), and 500 soldiers are buried there. Bethlehem was prominent during the Revolution, also, as a thoroughfare for troops, and as a temporary refuge of the Continental Congress. The village became a borough in 1845; the city now has the commission form of government.

The Bethlehem Bach Choir, established by Dr. J. Frederick Wolle, is one of the few organizations in the United States devoted entirely to the presentation of the works of one man. The Bach festivals are held in the spring of each year, and attract music-lovers throughout the world.

Transportation. The borough is served by the Central of New Jersey, the Lehigh & New England, the Reading, the Lehigh Valley, and the Philadelphia, Bethlehem & New England railroads, and by interurban and motorbus lines to near-by cities and towns.

Industry. The parent plant of the Bethlehem Steel Company is located here; steel and iron are the most important products of the town. Silk-making is the second largest industry. The great factories also produce electrical apparatus, rubber tires, spark plugs, hosiery, cigars, flour, and furnaces.

A.H.B.

BETHMANN-HOLLWEG, *bate' mahn hol'-vayK*, THEOBALD THEODORE VON (1856-1921), a German jurist and statesman, fifth Chancellor of the German Empire and the leader of the German government during part of the World War. Bethmann-Hollweg acquired a peculiar interest for Americans in 1915, when it became known that he was opposed to the policy of torpedoing, without warning, passenger

ships of the nations with which Germany was at war. It is said to have been largely through his influence with Emperor William II that diplomatic relations were preserved between Germany and the United States until 1917.

To this man, more at home in the study than in the councils of state, fell the task of piloting the empire through the first three years of its greatest crisis. He was the son and grandson of famous men who had held high offices, and, born of a wealthy family, he rose rapidly in the ranks of officialdom. He became governor of the province of Brandenburg in 1899, and in 1905, Prussian Minister of the Interior. In 1907 he left the Prussian ministry to become Secretary of State for the Interior in the German Empire and Vice-Chancellor under Prince von Bülow. In 1909 he succeeded to the Chancellorship, but resigned in 1917.

BEVERIDGE, *bev' ur ij*, ALBERT JEREMIAH (1862-1927), an American politician, orator, and writer, twice United States Senator from Indiana, and a statesman of strong progressive principles.

His rapid advance to prominence from the obscurity of an Ohio farm was remarkable. After a boyhood of hardship and poverty, he attended high school, and then entered De Pauw University, Greencastle, Ind., where he was graduated in 1885. Two years later, he was admitted to the bar, and began his practice in Indianapolis.

Beveridge's gift of oratory was a great factor in the early success which carried him to the United States Senate in 1899, at the age of thirty-seven. He served two terms, but was defeated for a third term. In 1912 he was a leader in the Progressive party, which nominated Theodore Roosevelt for President. Beveridge was twice defeated as a candidate for governor of Indiana, in 1914 as the Progressive party candidate, and in 1922 as the Republican nominee.

Senator Beveridge was famous not only as an orator and statesman, but also as an author and historian. His best-known work is a *Life of John Marshall*; at the time of his death he was working on a *Life of Lincoln*, to which he had expected to devote more than five years. It is complete to the year 1859.

BEVERLY, *MASS.* See MASSACHUSETTS (back of map).

BEZER, *be' zair*, one of the Cities of Refuge (which see).

BHILS, *beelz*. See INDIA (The People).

BHUTAN, *boo tahn'*, an independent state, with an area of about 20,000 square miles, in the southern part of Asia. It lies between

Tibet on the north and British India on the south, in the eastern Himalayas, where the mountains abound in sublime scenery and raise their snow-clad peaks to heights of over 24,000 feet. The greater part of the country



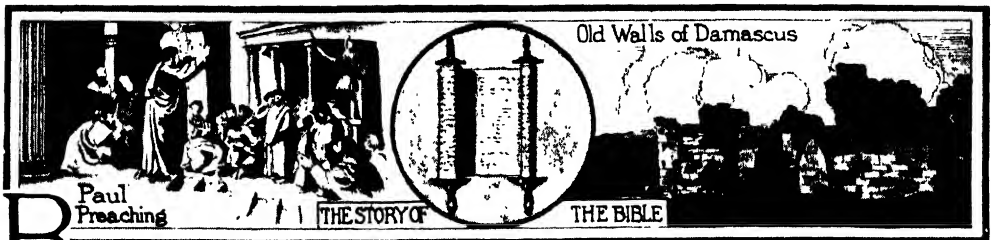
LOCATION MAP

Bhutan is shown as a black dot, northeast of India

is covered with extensive and valuable forests.

The inhabitants, numbering about 250,000, are Buddhists of the Mongolian race. They are skilled agriculturists, and in the fertile parts of the territory grow millet, maize, wheat, and rice; they also breed elephants and ponies. Their chief manufactures are coarse cloths, silks, guns, and swords of highly tempered steel. The capital is Punakha, also called Dosen. Although ruled by a hereditary chieftain, Bhutan is subsidized by the English government in India.

BIAS, *be' ahs*. See SEVEN WISE MEN OF GREECE.



BIBLE. The man who sets out on a journey around the world finds that it does not take long to reach a place where most of the things which assume importance in his own life seem unimportant or unknown. The works of Dumas and of Shakespeare; the dramas of Ibsen and Goethe—these have

found their way over a comparatively small part of the earth's area. But there is one book which the traveler finds in the remotest part of the earth. Farther than the railroad has penetrated or the most daring gold-seeker has ventured, the Bible has found its way, until it is almost literally true that there is no

country in which it has not made for itself a home.

This does not mean that the knowledge of the Bible has spread throughout the world; that the Eskimo hut or the African *kraal* has its Bible, as has the American or English family; but it does mean that it has been so frequently translated and so widely distributed that almost everybody may possess at least parts of it in his own language. In all, there are 108 complete translations and over 500 partial translations; and more than 25,000,000 copies of the Bible or of the New Testament are distributed each year.

It is, and has been for many years, the "world's best seller." For no other book can the claim be made that in a single year forty-seven copies have been distributed every minute of every hour, day and night, for the entire year; such a record the Bible has achieved. Hundreds of thousands of copies are given away yearly, yet it is salable, in addition, by the millions.

What It Is. The Bible is frequently called *The Book*, but it could with accuracy be called *the library*, for it is in reality a library of sixty-six books for Protestants, and seventy-two for Roman Catholics. Even the name to-day has the singular form, but originally it was a Greek plural meaning *books*. These sixty-six or seventy-two books have a greater unity than most libraries, for while they include essays, stories, love songs, dramas, and legal documents, they constitute together the sacred writings of Judaism and Christianity, and they have running through them a single thread of purpose. The Jews felt that to them, and to them alone, had been granted the revelation of the true God, and their sacred writings had as their purpose the setting forth of this revelation for future generations—for future generations of *Jews*, for it was too wonderful and too sacred to be wasted on Gentiles, or "heathen."

This was the older part of the Bible—the Old Testament, as it is commonly known. The New Testament aimed with no less singleness of purpose at giving a revelation of God, but it spoke to a wider audience. Its teachings were for "all the world," "to the Jew first, and also to the Gentile." Thus it is that the Jews of to-day accept only the Old Testament, while for Christians the two parts have equal authority.

The Story of Its Long Life. Long ago, when the sacred writings received their name of *The Books*, that word meant a very different thing from what it does to-day. It referred to the rolls of papyrus, on which were inscribed by hand those writings which were counted worthy of publication (see MANUSCRIPT). On such rolls were inscribed the earliest sacred writings of the Jews, and it

was probably such a manuscript that was delivered to Jesus when "He went into the synagogue and stood up for to read." At that time there existed only the Old Testament, but as the founders of the Christian Church wrote out their records of its origin, or sent to individual churches their advice in letters, these, too, became a part of the Holy Scriptures.

As Christianity spread to Europe, the influence of the sacred writings spread also. Interest in secular learning died out in the troubled times of the later Roman Empire and in the Dark Ages which followed, but love for *The Book* never flagged. It seems not too much to say that knowledge of the arts of reading and writing might have died out had it not been for this concern for the sacred writings. There were no printing presses in those days, and every new copy of the Scriptures had to be laboriously written out by hand. Each monastery had its writing room, in which the monks toiled over their precious manuscripts, keeping heart and hand and pen clean, that they might be worthy of the high task. In his *Golden Legend*, Longfellow put into the mouth of a monk the words—

It is growing dark! Yet one line more,
And then my work for to-day is o'er.
I come again to the name of the Lord!
Ere I that awful name record,
That is spoken so lightly among men,
Let me pause awhile, and wash my pen;
Pure from blemish and blot must it be
When it writes that word of mystery.

Some of these manuscripts were very beautiful, for they were frequently embellished, or illuminated, with gold and silver and glowing colors. Longfellow's monk continues:

There, now, is an initial letter!
Saint Uric himself never made a better!
Finished down to the leaf and the snail,
Down to the eyes on the peacock's tail!

So the Bible was kept alive by the monks' labor of love, until in the fifteenth century there came that wonderful invention which revolutionized learning—the invention of printing from movable types. So far as is known, the first book printed by Gutenberg (which see) was a Bible. This was the Mazarin Bible, printed in 1452 (see below). In many instances it has been necessary to design and make special types for the printing of the Bible in languages which had never before known a printed book, but no difficulty has been so great as to daunt those who have determined to make it possible for everyone, everywhere, to read the Bible, or parts of it, in his own language.

From One Language to Many. In a sense, the writings of any great author make up a library, but the Bible differs from such a col-

lection in that it is the work of about forty authors. All of its books, with the exception of *Daniel* and *Ezra*, which were in Aramaic, were written in Hebrew or in Greek; but the Hebrew books, those which comprised the Scriptures in the time of Christ, had all been translated into Aramaic, for Hebrew had at that time become a dead language. Further translations, too, were necessary, for many of the Jews had settled in various countries and had adopted the languages of the native inhabitants.

Of these ancient translations into other tongues, by far the most valuable was that known as the *Septuagint*, which was completed in 285 B.C. It is a translation from Hebrew into Greek of such parts of the Scriptures as then existed, and it received its name, which means *seventy*, from the fact that about that number of scholars at various stages had taken part in the work of translation.

The Vulgate and the Douai. The time came, however, when Christianity became the religion of the Roman world, and Latin-speaking Christians demanded the Bible in their own tongue. Jerome, one of the most famous of the early Church fathers, completed such a translation in A.D. 405, and this *Vulgate*, as it was called, became the authorized Bible of the Western Church. The name *Douai*, or *Douay*, Bible was applied to the translation of the Vulgate, or early Roman version; the Council of Trent, in advance of its publication, declared that it should be authoritative for English-speaking Catholics. The original Douai edition is therefore the foundation on which practically all the Roman Catholic versions are based. The Douai New Testament was published at Rheims in 1582, and the Old Testament, completing the work, in 1609, at Douai.

In Modern Tongues. Long after Christianity spread to countries where no Latin was spoken, that language continued to be used in the churches, and the earliest suggestions

that the Bible should be translated into the vernacular, or tongue of the common people, met with violent opposition. Express the sacred truths which had stood supreme in the Church for centuries in the vulgar language of the people? It was not to be thought of! But in every enlightened country there were brave men who dared to fight against tradition to bring the Bible within reach of all. In Germany, Luther's translation was epoch-making, not only in religion but in the literature and language of the country, for it helped to crystallize the all-too-fluid dialect forms

In England, there were several worthy of note—Wycliffe's translation, finished about 1380; Tyndale's,

upon which modern versions of the English Bible are based; and Coverdale's, which was printed in 1535, and was the first complete English Bible published.

The Accepted English Versions. Several English editions of the Bible followed Coverdale's, each of which attempted to correct the errors and improve the language of previous editions, but none proved wholly satisfactory. In 1604, therefore, acting on the petition of the leading clergymen of the country, James I of England appointed fifty-four eminent scholars to make a new translation. For seven years they worked at their task, and the *King James*, or *Authorized Version* which they produced so far surpassed in accuracy, arrangement, and language all those versions which had gone before that within a few years it supplanted them all. English-speaking Protestant churches throughout the world adopted it, and until the



Photo U & U

WORTH MORE THAN ONE HUNDRED THOUSAND DOLLARS

What is known as the Melk copy of the famous Gutenberg Bible, the first book ever printed from movable type, was sold in 1926 for \$100,000, probably the highest price ever paid for a book. It was purchased by Dr. A. S. W. Rosenbach, a physician of New York. Above the picture of the Melk copy is the "Thumb Bible," printed in Scotland by Taylor in 1670. It is also owned by Dr. Rosenbach, and is valued at \$1,000.

latter part of the nineteenth century it had no rival.

Biblical knowledge had not stood still, however, and the English language had changed

so that some parts of the Bible had acquired different meanings from those which they had had when the translation was made; mainly for this reason, in 1870 a company of English scholars, aided by a group of distinguished Americans, set about making a new translation. So far as possible, they kept the stately language of the King James Version, which had become firmly fixed in the affections of the people; but where

changes in diction were necessary for the clearing up of obscurities, they did not hesitate to make them. Many a reader to-day, who is grateful for the new light thrown upon the Book by this *Revised Version*, still prefers to

as "the Bible translated into American," that is, into the ordinary conversational language of the people. A good example of the modern style employed by Dr. Goodspeed is seen in

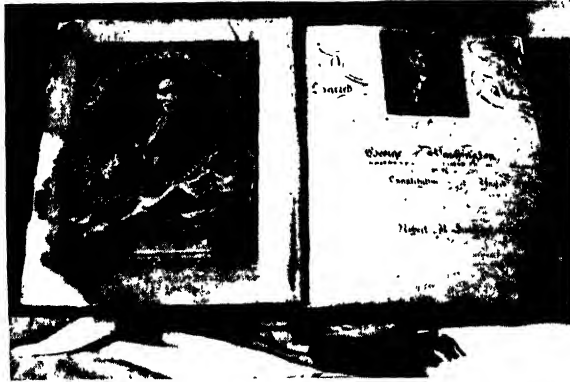
his version of the thirteenth chapter of *I Corinthians*:

If I can speak the language of men and even of angels, but have no love, I am only a noisy gong or a clashing cymbal. If I am inspired to preach and know all the secret truths and possess all knowledge, and if I have such perfect faith that I can move mountains, but have no love, I am nothing. Even if I give away everything I own, and give myself up, but do it in pride, not love, it does me no good. Love is patient and kind. Love is not envious or boastful

It does not put on airs. It is not rude. It does not insist on its rights. It does not become angry. It is not resentful. It is not happy over injustice, it is only happy with truth. It will bear anything, believe anything, hope for anything, endure anything. Love will never die out. If there is inspired preaching, it will pass away. If there is ecstatic speaking, it will cease. If there is knowledge, it will pass away. For our knowledge is imperfect and our preaching is imperfect. But when perfection comes, what is imperfect will pass away. When I was a child I talked like a child, I thought like a child, I reasoned like a child. When I became a man I put aside my childish ways. For now we are looking at a dim reflection in a mirror, but then we shall see face to face. Now my knowledge is imperfect, but then I shall know as fully as God knows me. So faith, hope, and love endure. These are the great three, and the greatest of them is love.

The Divisions of the Bible. The Jews looked upon their religion as a compact between themselves and God, and they applied to the sacred writings the title of *Covenant*, or *Testament*. Since this latter form attained wider use than the former, the later books were called the New Testament, and the two great divisions of the Bible are known to-day as the *Old and New Testaments*.

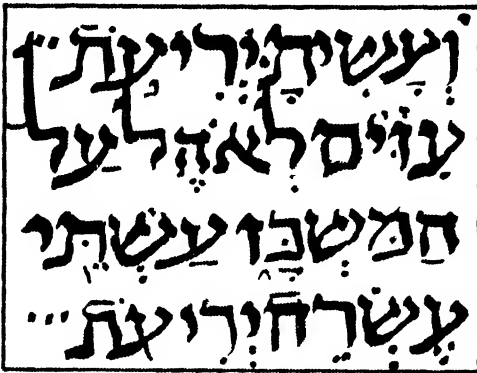
The Old Testament. This division, which deals with the Jews and their history under the old Mosaic laws, consists of thirty-nine books, which admit of a very definite classification into books of law, history, prophecy, and poetry. The law includes the first five books, *Genesis*, *Exodus*, *Leviticus*, *Numbers*, and *Deuteronomy*; the historical division



A FAMOUS BIBLE

Photo Keystone

It was used for the first time at the inauguration of George Washington as President of the United States, in 1789, and again at the inauguration of President Harding in 1921. The frontispiece bears an artistic steel engraving of King George II, and on the opposite page is an engraving of Washington. The book is owned by Saint John's Lodge of Free and Accepted Masons, No. 1, of New York City.



SPECIMEN OF EARLIEST MANUSCRIPT

A portion of *Exodus* (chapter xxvi, verse 7), written in square Hebrew. This was translated into Syriac, Greek, Latin, Anglo-Saxon, Old English, and finally into present-day English.

read the older version, familiar through long use.

The *American Revised Version*, which embodies all the results of recent investigations, was made still later.

In 1923, Dr. Edgar E. Goodspeed of the University of Chicago published a version of the New Testament which may be described



Photo. U & U

A Sacred Scroll and Its Guardian. A Samaritan high priest and an old Pentateuch roll, at Shechem, Palestine. This scroll is a priceless treasure, and the most elaborate means are employed to preserve and guard it.

comprises all the books from *Joshua* to *Esther*; the poetry embraces *Job*, *Psalms*, *Proverbs*, *Ecclesiastes*, *Song of Solomon*, and *Lamentations*; and the prophetic division comprises the remaining sixteen books. The authors of some of these books are definitely known; of others, the authorship is traditional; while as to the origin of a number of them, absolutely nothing is known. Throughout century after century, the first five books were ascribed to Moses, and the daring person who ventured the question, "But how could Moses have described his own death?" was looked upon as a dangerous skeptic. The *Psalms*, too, were credited to David without question. But present-day criticism is by no means so sure of its ground, and there is hesitation to declare with certainty the authorship of either of these groups of writings.

The New Testament. The twenty-seven books which comprise this division fall into three natural groups. First, there are the historical books, the four Gospels, and the *Acts of the Apostles*; then the *Epistles*, and finally the curious, prophetic, visionary *Revelation*. Even the earliest of the Gospels was not written until years after the Ascension; the story of Jesus was handed down by word of mouth until there grew up the fear that parts of it might be lost, and then Mark wrote his narrative, the first of the Gospel accounts. The Gospel of John was the latest book, and was probably not written until the beginning of the second century of the Christian Era.

The Canon. This is a curious word with an interesting history, as used in this connection. Originally it meant a *rod*, or by derivation, a *carpenter's rule*, and so in time it came to have reference to the standard by which the authority of the sacred writings was measured. The term "canon of the Scriptures" denotes those books which are believed to have been inspired, and they are therefore authorized by the Christian Church. Just those books which at present make up the total of the Bible were not always looked upon as the canon; over certain specific books long controversies raged. Could the book of *Esther*, in which the name of God is not once mentioned, possibly be one of the "holy" writings? Were the books of the Apocrypha to be regarded as inspired, or were they merely secular? Before the time of Christ, the Jews had determined the canon of the Old Testament, but that of the New Testament was naturally not entirely fixed until some centuries after Christ's death. To-day the Roman Catholic Church accepts as canonical the Apocrypha, but the Protestant churches reject them.

The Bible as Literature. The writers of the Bible were not learned men, as the world counts learning to-day, and yet their works have lived and multiplied as have no others

ever written. In large measure, to be sure, this is because of the subject matter with which they deal, but in a lesser degree it is an outgrowth of the literary character of the Bible. Time was, and not so very long ago, when to have spoken of the "literary character" of the Bible would have been looked upon as sacrilege. It was a sacred book, designed to appeal to man's spiritual nature, and taking no account of the feeling for beauty, which is no less an inborn sense. Indeed, in those days when the Bible was perhaps more in men's thoughts than at any time since the days of the Church fathers—in the Puritan age—the spiritual sense and the sense of beauty were looked upon as antagonistic.

Then, too, the Book was looked upon as too sacred to be studied as any other book might be; people actually held that its holy character extended to the paper upon which it was printed and to the boards in which it was bound. To ponder over it spiritually was right and necessary—"in His law doth he meditate day and night"; but to attempt to solve its problems by aid of cold reason—such an act was to lay profane hands upon the Ark of the Covenant or to enter with unhallowed feet the Holy of Holies. One eminent writer upon things Biblical phrased the matter picturesquely when he called the Bible "a literature smothered by reverence."

In recent years, students of the Bible have been paying more and more attention to its literary quality, although students of literature have placed upon it too little stress. Many a person who accounts himself well read, and is ashamed to confess his ignorance of the works of some minor poet, almost boasts of his lack of knowledge of the Bible. However, no one can really understand English literature or grasp its full significance who has not a background of Biblical knowledge. What can Byron's stirring *Destruction of Sennacherib* mean to the person who has never read the account in *II Kings*? We are told that—

The Assyrian came down like the wolf on the fold,
And his cohorts were gleaming in purple and gold,
and that later—

The Angel of Death spread his wings on the blast,
And breathed in the face of the foe as he pass'd,

but no statement is made as to who Sennacherib was, or as to the reason that such dreadful woe came upon the Assyrians. Or, how can the person who has not read the story of Moses' experience on Sinai grasp the full significance of Lowell's—

Daily, with souls that cringe and plot,
We Sinais climb and know it not.

But it is not only as a background for other literature that the Bible merits attention. It is itself unmatched in certain literary forms.

A tremendous literature of war songs, laments, proverbs, prayers, love lyrics, and stories is to be found in its pages. In lyric poetry, especially, critics agree that it equals, if it does not surpass, all other literatures in the world. The translators, too, have been so wise in their choice of words that the English reader has little or none of that disappointed feeling which usually accompanies the reading of translations. So wonderfully phrased are almost all parts of the Scriptures that the person who cares nothing for the spiritual significance of the Bible cannot fail to be impressed with the fact that if Biblical quotations are contrasted with those from almost any other work, they take from such quotations much of their dignity and stateliness.

The Bible for Children. This topic is closely related to the preceding, in that it emphasizes the "story" side of the Bible. Any truth which is presented to children must of necessity be in story form, and the Bible is at its best in this field. It was written in the childhood of the race, by men who were striving not to attain literary distinction, not to embellish their works highly, but merely to tell their stories and sing their songs simply and directly. Tolstoi phrased most forcibly the relation between this fact and the appeal of the Bible to children. "It seems to me," he wrote, "that the Book of the childhood of the race will always be the best book for the childhood of each man." He goes on to tell of his experience in teaching peasant children, whom he had tried to interest through other means:

Then I tried reading the Bible to them, and quite took possession of them. The corner of the veil was lifted, and they yielded themselves to me completely. They fell in love with the Book and with learning and with me

The vivid stories of men and women who seem alive and who have to do with those fascinating things which most interest children cannot fail to attract and hold attention. Joseph, with his marvelous coat, with his adventures in the pit and in prison, and with his final triumph, is a hero after their own hearts; and the stories of David's giant, Jonathan's bow and arrows, and Daniel's lions are just the adventurous touches which they love. The finding of Moses is an old story which to children is ever new. As they grow older, they have the pastoral of Ruth, with its "happy ending," and the no less charming, but more stirring, prose epic of Esther. There are books of Bible stories without number, some excellent, some mediocre, and some poor; but as soon as the child is old enough to appreciate them, he should be given his Bible stories in Bible language. Not only does this enhance their charm, but it gives the boy or girl a taste of well-chosen, virile English,

which most of the harmless, but carelessly constructed, children's books of the present day do not provide. The story of the Three Wise Men, the moral from the tale of the Good Samaritan, and the warning in the handwriting on the wall cannot be excelled, and there are hundreds of other interesting tales. Twenty of the best short stories of the Bible appear below:

Joseph. *Gen xxxvii-xlviii.*
 Balaam and Balak. *Num xxii-xxiv.*
 The Capture of Jericho. *Josh vi*
 The Wars of Gideon. *Judg vi-viii*
 Jephthah's Daughter. *Judg. xi.*
 Samson. *Judg xiv-xvi*
 Ruth. The entire book
 David and Goliath. *I Sam xvii*
 David and Jonathan. *I Sam xviii-xx.*
 Elijah and the Prophets of Baal. *I Kings xviii.*
 Naboth's Vineyard. *I Kings xxi*
 The Ascension of Elijah. *II Kings ii.*
 Esther. The entire book.
 The Three Hebrew Children. *Dan iii.*
 Daniel in the Lions' Den. *Dan. vi.*
 Jonah. The entire book.
 The Good Samaritan. *Luke x, 25-37*
 The Prodigal Son. *Luke xv, 11-32.*
 The Healing of the Lame Man at Bethesda. *John v, 1-9*
 The Shipwreck of Saint Paul. *Acts xxvii*

Biblical Chronology. The general reader of the Bible, as well as the student, cannot fail to be interested in the location of the events in point of time. Does anyone know when Abraham went out from Ur of the Chaldees? Did David live before or after the Trojan War? The Jews reckoned time from the Creation, and by computing the generations before and after the Deluge, worked out a complete system of chronology. According to them, the Creation took place about 4,000 years before the birth of Christ, and the outstanding events occurred in the years here set down:

Creation of the world	(B C) 4000
The Flood	3200
Call of Abraham	2000
Israelites enter Egypt	1700
The Exodus	1300
Saul anointed king	1095
David began to reign	1055
Solomon began to reign	1015
Division of the kingdom . .	975
Fall of the kingdom of Israel	722
Fall of the kingdom of Judah	586
Return from the Captivity	536
Conquest of Palestine by Alexander	330
Capture of Jerusalem by Pompey	63

The correctness of these dates previous to the reign of Saul, it should be stated, is open to criticism; among historians and Bible students, Hebrew chronology is considered to stand by itself until such time as the dates

BOOKS OF THE BIBLE

THE OLD TESTAMENT

<i>Book</i>	<i>Traditional Author</i>
Genesis	Moses
Exodus	Moses
Leviticus	Moses
Numbers	Moses
Deuteronomy	Moses
Joshua	Joshua
Judges	*Samuel
Ruth	Unknown
I and II Samuel	Unknown
I and II Kings	Unknown
I and II Chronicles	*Ezra
Ezra	Ezra
Nehemiah	Ezra
Esther	*Unknown
Job	Uncertain
	David
	Asaph
	Levites
Psalms	Hezekiah
	Solomon
	Prophets
	Solomon
	Agur
Proverbs	Unknown
Ecclesiastes	Solomon
Song of Solomon	Solomon
Isaiah	Isaiah
Jeremiah	Jeremiah
Lamentations	Jeremiah
Ezekiel	Ezekiel
Daniel	Daniel
Hosea	Hosea
Joel	Joel
Amos	Amos
Obadiah	Obadiah
Jonah	Jonah
Micah	Micah
Nahum	*Nahum
Habakkuk	Habakkuk
Zephaniah	Zephaniah
Haggai	Haggai
Zechariah	Zechariah
Malachi	Malachi

THE NEW TESTAMENT

Matthew	Matthew
Mark	Mark
Luke	Luke
John	John
Acts of the Apostles	Luke
Pauline Epistles	Saint Paul
Romans	
I and II Corinthians	
Galatians	Philippians
Ephesians	Colossians
I and II Thessalonians	
I and II Timothy	
Titus	Philemon
James	James
I and II Peter	Peter
I, II, and III John	John
Jude	*Jude
Hebrews	*Uncertain
Revelation	John

given coincide with dates of events in secular history.

Books of the Bible. The table on this page lists the books of the Bible and gives their authors, so far as they are known, but it must be borne in mind that often the authorship cited here is merely traditional. The books marked with a star are those about which there has been the greatest amount of controversy and uncertainty. Separate articles on the more important of the books listed will be found in their alphabetical order in this work.

Famous Versions of the Bible. Several early versions of the English Bible are famous either for some eccentricity of their translation or for some remarkable feature of their publication. Among them are the following:

Breeches Bible (1560), so called because it related that Adam and Eve "sewed fig leaves together and made themselves breeches."

Bug Bible (1551). In the Ninety-first Psalm, for the line, "Thou shalt not be afraid for the terror by night," it substitutes, "afraid of bugs by night."

Caxton Memorial Bible. In 1877, four hundred years after the introduction of printing into England, this Bible was printed and bound in twelve hours, to celebrate the occasion.

Mazarin Bible (1452), the first book to be printed wholly from movable types. The first copy was found in the property of the French Cardinal Mazarin.

Treacle Bible: substitutes the word "treacle" for "balm," in the line "Is there no balm in Gilead?"

Vinegar Bible (1717): substitutes "vinegar" for "vineyard," in the parable of that name.

Related Subjects. These volumes contain a great number of articles on Biblical topics—the books of the Bible, the characters, and kindred topics. For convenience of reference, these are listed here, with the exception of the books, which are given in the preceding column.

Aaron	Decalogue
Abel	Delilah
Abraham	Deluge
Absalom	Devil
Adam and Eve	Eden
Ahab	Eli
Ahasuerus	Eljah
Ahaz	Elsha
Amalekites	Esau
Ananias	Esther
Apocalypse	Ezekiel
Apocrypha	Ezra
Apostles	Festus, Porcius
Apostles' Creed	Gabriel
Archangel	Galilee
Ark	Gamaliel
Armageddon	Gath
Baal	Gaza
Babel, Tower of	Gehenna
Balaam	Gethsemane
Barabbas	Gideon
Barnabas	Gilead
Beelzebub	God
Belshazzar	Goshen
Benjamin	Gospels
Cain	Habakkuk
Canaanites	Hades
Chaldea	Haggai
Cherub	Haman
Cities of Refuge	Hell
Daniel	Herod
David	Hezekiah
Deborah	High Priest

OUTLINE AND QUESTIONS ON THE BIBLE

Outline

I. What It Is

- (1) Its name
- (2) Its place in the world
- (3) A library, not a book

- (b) The Authorized Version
- (c) The Revised Version
- (d) American Revised Version

II. The Canon of the Scriptures

- (1) Old Testament
- (2) New Testament
- (3) Apocrypha

V. Contents

- (1) Old Testament
 - (a) Law
 - (b) History
 - (c) Prophecy
 - (d) Poetry
- (2) New Testament
 - (a) History
 - (b) Letters
 - (c) Prophecy

III. Origin

- (1) Dates of writing
 - (a) The oldest book
 - (b) The youngest book
- (2) Authors
- (3) Language

VI. Chronology of the Bible

- (1) Important dates
- (2) Its uncertainty

IV. Translations

- (1) The Septuagint
- (2) Vulgate
- (3) The Bible in English
 - (a) Early versions
 1. Wycliffe's
 2. Tyndale's
 3. Coverdale's

VII. The Bible as Literature

- (1) The new attitude
- (2) Reasons for its charm
- (3) Its value for children

Questions

What is the meaning of the name *Bible*?

How many books of history are there in the New Testament? Name them.

Why was the Septuagint so called? Is the title strictly accurate?

What are the books of law? The prophetic books?

About how many Bibles and New Testaments are distributed each year?

What is meant by the "canon"? What books form part of it?

About how early were the first translations from the Hebrew?

What was the first complete Bible published in English?

What was the form of the sacred writings possessed by the Jews?

What event, according to Bible reckoning, took place almost as long before the beginning of the Christian Era as the Norman Conquest did after it?

How many letters of Paul are part of the New Testament?

What change has taken place in comparatively recent times in the attitude toward the Bible?

How many complete translations of the Bible have been made?

By what other name is the Authorized Version known? Why is it so called?

What quality have many of the Bible stories that makes them suitable for children?

According to tradition, who wrote the first five books of the Old Testament?

In what language were *Daniel* and *Ezra* originally written? Why was the entire Old Testament later translated into this tongue?

What reasons were there for making a revised version of the Scriptures?

Hittites	Moses
Hosea	Nahum
Isaac	Nehemiah
Isaiah	New Testament Chronology
Ishmael	New Testament Criticism
Jacob	Nimrod
James, Saint	Noah
Jehoshaphat	Ophir
Jehovah	Passover
Jehu	Patriarchs
Jeremiah	Paul
Jesus Christ	Pentateuch
Jezebel	Pentecost
Job	Pharisees
John the Baptist	Philip the Evangelist
John, Saint	Philistines
Jonah	Pilate, Pontius
Joseph (husband of Mary)	Prophet
Joseph	Rachel
Joseph of Arimathea	Ruth
Joshua	Sadducees
Josiah	Samaritans
Jubilee	Samson
Jude	Samuel
Judea	Sanhedrin
Judith	Saul
Lazarus	Scapegoat
Leviathan	Scribes
Levites	Selah
Litany	Septuagint
Liturgy	Sinai
Lucifer	Sodom
Luke, Saint	Solomon
Malachi	Tabernacle
Manna	Tabernacles, Feast of
Mark, Saint	Targum
Mary, the Virgin	Timothy
Mary Magdalen	Titus
Matthew, Saint	Vulgate
Michael, Saint	Zebulun
Miracle	Zedekiah
Moabites	Zephaniah

In addition to these, there is given under PALESTINE a list of the Biblical places treated in these volumes.

BIBLE COMMUNISTS. See ONEIDA COMMUNITY.

BIBLE SOCIETY, AMERICAN, a non-denominational society whose aim is the distribution of the Bible to all the peoples of the world.

Since the Society was founded in 1816, it has distributed over 180,000,000 copies of the Bible. A single year's issue in the United States is now more than 4,000,000, while those given out through foreign agencies number over 5,000,000 yearly. These Bibles are furnished at cost, and are distributed through the branches of the Society all over the world.

The Society has also undertaken the revision and translation of the Bible into many foreign languages and dialects, in an effort to make the Book available to all people. The headquarters of the American Bible Society are at the Bible House, Astor Place, New York City; its official publication is the *Bible Society Record*. The funds for operating the Society are derived from investments, gifts, and book sales.

BIBLE STUDENTS' ASSOCIATION, an international society for the study and discussion of the Scriptures.

BIBLIOGRAPHY, *bib lih og' ra fe*, a term which has changed from its original meaning—

the copying of books—and has come to denote writings about books, whether these concern themselves with the externals of books or with their contents. Collectors of rare books are especially interested in the former branch; they will pore long over bibliographies which give descriptions of old or rare books, their bindings, and the comparative value of different editions. The general reader, however, is far more interested in a bibliography which treats of the content of books.

Bibliographers have never quite relinquished the ambition of compiling one huge bibliography which shall include and classify all the books that have ever been published, but this remains as yet an unrealized dream. Special bibliographies, however, which either limit themselves to the books of one country or to those treating of some one subject, are numerous, and are constantly increasing in number. To the unsystematic reader, whose choice of books is guided by what he happens to see or hear, such works are of little value, but to the person who wishes to pursue a certain line of reading or find out all that has been written on some topic, they are indispensable.

BIBLIOMANIA, *bib li o ma' ni ah*, the irresistible desire to collect certain books, not because of the interest or helpfulness of their contents, but because of their rarity. Andrew Lang described this "mania" as the "love of books for their own sake, for their paper, print, binding, and for their associations, as distinct from the love of literature." Thus, the books of famous printers or binders, early or *de luxe* editions, uncut copies, especially illustrated copies, or even books which contain certain misprints, are eagerly sought.

There seems to be almost no limit to the price which a real bibliophile, or book-lover, will pay for a certain choice volume, especially if other book-lovers also want it. The largest sum on record paid for a single volume is \$106,000, the price of a Bible printed on vellum by Gutenberg, about 1450, and sold for that sum in 1926. A copy of the same edition, but printed on paper, was sold in 1912 for \$27,500. The only known perfect copy of Malory's *Morte d'Arthur*, printed by William Caxton, was sold in 1885 for \$9,750, and in 1912, for \$42,800; other books from Caxton's press bring from \$1,000 to \$15,000. The only copy now in existence, so far as known, of the first edition of Bunyan's *Pilgrim's Progress*, was sold in 1926 for over \$25,000. Books from the presses of other early printers, notably those of Jenson and Aldus at Venice, Sweynheym and Pannartz at Rome, and Ulric Gering at Paris, also bring high prices. The many books printed by the Plantin and the Elzevir families at Antwerp, Amsterdam, and Leyden are also eagerly sought.

A special field of great interest is the collec-

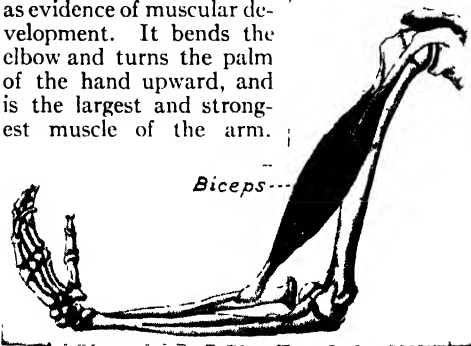
tion of books which have belonged to famous people and which contain bookplates, autographs, or other marks of original ownership. In recent years, there has been a growing interest in early books on America, also in the first editions or obscure works of famous modern writers, notably Poe, Thackeray, Dickens, Stevenson, and Kipling. A copy of the original 1827 edition of Poe's *Al Aaraaf, Tamerlane, and Other Poems* sold at auction in 1900 for \$2,050, and another copy, with an inscription in Poe's handwriting, brought \$2,900 in 1909.

Derivation. The word *bibliomania* is combined from two Greek words, and means *book madness*.

BIBLIOTHEQUE NATIONALE, *be ble o tek' nah syo nal'*, the largest library on the continent of Europe. It is located in Paris, and is the national library of the French people. Its splendid collections include over 3,000,000 printed volumes, many thousands of maps and manuscripts, more than 2,500,000 engravings, and over 400,000 coins and cameos. In 1536 it was decreed that one copy of every book printed in France should be deposited in the national library; this explains the large number of printed volumes it contains.

The sources of this library are, in the main, the library that Charles V arranged in the Louvre in 1367, and that of the royal Orleans family, at Blois. Francis I united the two libraries, and Charles IX brought them to Paris. Both Louis XIV and Napoleon took a great interest in the library.

BICEPS, *bi' seps*, the large muscle in the front of the upper arm. Its upper end is attached to the shoulder blade, or scapula, and its lower end by a tendon to the large bone, or radius, of the forearm. This is the muscle usually proudly exhibited as evidence of muscular development. It bends the elbow and turns the palm of the hand upward, and is the largest and strongest muscle of the arm.



LOCATION AND FORM OF BICEPS

The muscle opposed to the biceps, and by which the arm is straightened, is the *triceps*. See **ARM**; **MUSCLES**. K.A.E.

BICHLORIDE, *bi klo' ride*, **OF MERCURY**. See **CORROSIVE SUBLIMATE**; **DISINFECTANT**.

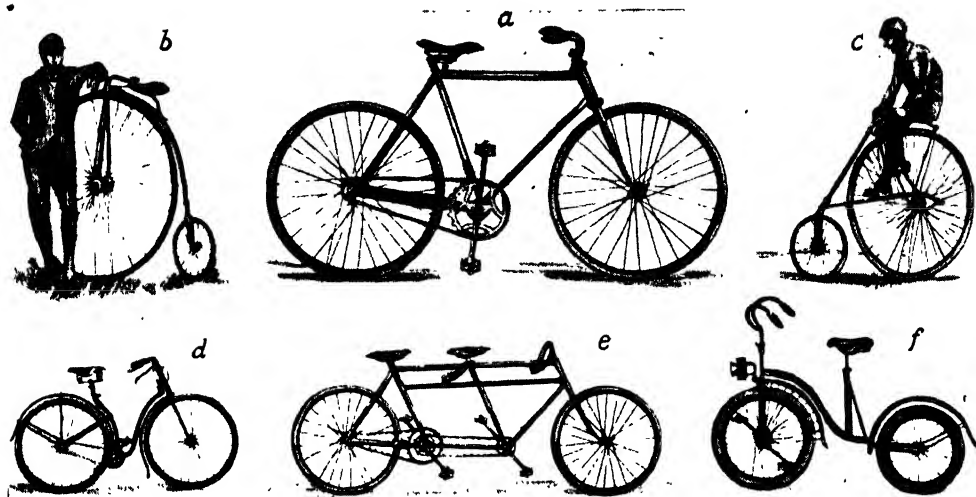
BISCUS'PIDS. See **TEETH**.

BI'CYCLE. The story of the bicycle furnishes an interesting example of the manner in which the delight of the public in various forms of recreation rises and declines. The familiar "safety" bicycle entered upon a period of wide popularity about the year 1889, and during the next ten years it enjoyed an astonishing vogue. It was ridden by old and young, and was as popular with women as with men. Bicycle enthusiasts found it equally satisfactory for recreation and for business purposes. In 1890 there were 312 bicycle establishments in the United States, and their combined output for the year reached a total of 1,112,880 machines. Then the tide turned, and after 1900 there was a gradual decline in the demand for these machines. Manufacturers of bicycles ceased advertising their wares, and many of them transferred their capital and equipment to the production of the motorcycle (a bicycle equipped with a gas engine) and the automobile. The bicycle is still used to a limited extent in the United States, but it will probably never again be a universal favorite. In Europe, however, especially in England, it is still a popular vehicle.

The essential features of the bicycle of latest construction are shown in figure *a* in the illustration.

Evolution of the Bicycle. A crude, two-wheeled vehicle propelled by the feet was known to the ancients, and machines of this character were in use in England, France, and Germany many years before the real fore-runner of the modern bicycle was devised. This machine, invented in 1816 by Baron von Drais, chief forester to the Grand Duke of Baden, and called *draisine* in honor of him, consisted of two wheels of equal size, arranged tandem and connected by a perch. The rider, who rested part of his weight on the perch, propelled the machine by striking the ground with his feet. A padded arm-rest on a bar attached to the front wheel served as a handle bar and steering apparatus.

A machine modeled on the *draisine* was patented in England in 1818, where it enjoyed a brief period of popularity under various names — hobby-horse, dandy-horse, swift-walker, and others. Its manufacturer, however, named it the *pedestrian curricule*. This machine and others modeled on it failed to win permanent favor. In 1855 a French carriage-maker brought out a vehicle resembling the modern bicycle, in that it had cranks and pedals fitted to the front wheels, and ten years later an improved form of two-wheeled *velocipede* appeared in Paris, greatly stimulating interest in cycling and resulting in the introduction of the French velocipede into the United States.



THIRTY YEARS OF BICYCLE DEVELOPMENT

(a) Modern bicycle, (b) the so-called "ordinary," the immediate predecessor of (f), the first "safety", (c) the "Star" bicycle, with small wheel in front, (d) the "safety" adapted for the use of women; (e) the "tandem," for two, which could be developed on the same principle for three, four, or even six people.

This velocipede, like the high-wheeled bicycle which followed it, had the front wheel much larger than the rear, and was propelled by cranks attached to the hubs of the front wheel. Its successor, known as the *ordinary*, which was developed in England about 1873, was in general use in Europe and America until replaced by the low-wheeled bicycle, or *safety*. The first vehicle of this type had the front wheel about three times the size of the back one, but the tendency was to increase the size of the former and to reduce that of the rear wheel, until the diameters were respectively sixty and sixteen inches. The average roadster of 1875 weighed sixty-five pounds; it had a steel frame and solid rubber tires.

During the next ten years various improvements were introduced, including adjustable ball bearings and cushion tires. The "ordinary" was popular because it afforded exhilarating exercise, but it had serious defects. The high seat, more than five feet above the ground, and nearly over the center of the large wheel, made falls, or "headers," as they were called, somewhat frequent and dangerous, and the vehicle was difficult to mount. It is not surprising, therefore, that a low-wheel vehicle embodying the principal features of the modern bicycle was finally brought out, in 1884. Of the subsequent improvements, including the coaster brake, adjustable handle bars, cushion saddles, and the drop frame for ladies' bicycles, the most important was the pneumatic tire. Though invented in England in 1843, this device was not applied to the bicycle until 1880, and it was the greatest single factor in stimulating the popularity of the "wheel."

The cyclist might be subjected to the trouble of mending punctured tires, but whatever annoyance he suffered on this account was more than offset by the freedom from jolts, greater ease in running, and the increased lightness of his machine.

The bicycle era was not unproductive of good results, for in moderation it provided very healthful exercise; and the extensive use of the bicycle, together with the influence of the League of American Wheelmen, contributed much to the beginning of the good-roads movement that has been so greatly advanced by the advent of the automobile.

BIDDEFORD, ME. See MAINE (back of map).

BIELA'S, be' lahzh, COMET. See COMET.

BIENNIALS, bi en' i alzh, in botany, are those plants that put forth shoots and roots the first season, remain quiet through the winter, and the next spring or summer bear blossoms, fruit, and seed, and then die. That is, their life-span is two years, or two growing seasons. Familiar examples of biennials are the turnip, beet, and carrot, which accumulate food in their roots the first season; with the production of shoots in the second season this reserve is utilized, especially during the period of flowering. Plants that live for one year or less are known by the name of *annuals*, while *perennials* live on year after year for an indefinite period. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles.

Annuals
Botany

Weeds

Perennials
Plant

BIENVILLE, *byaN veel'*, JEAN BAPTISTE LE MOYNE, Sieur de (1680-1758), a well-known explorer who was prominent in the settlement of the French province of Louisiana. When yet a boy, he accompanied his brother Iberville (which see) on his early explorations of the Mississippi, and assisted him in founding Biloxi, in 1699. He was appointed governor of Louisiana in 1701, at the age of twenty-one; he founded the city of Mobile, which he made the seat of government, but he was removed from office in 1707. Bienville continued to be active in the upbuilding of the province, however, and in 1718 was again made governor. In that year, with the aid of Law's Mississippi Company, he founded the city of New Orleans. This place became the capital of Louisiana province in 1722. Four years later, Bienville was again dismissed, but was reinstated in 1733, and for the next ten years he worked with untiring zeal for the prosperity of his colony. From 1743 until his death he lived in France. See MISSISSIPPI SCHEME; NEW ORLEANS (History).

BIERSTADT, *beer' stah't*, ALBERT (1830-1902), a landscape painter whose popularity rests on his pictures of scenes in the Western United States, especially in the Rocky Mountains. He was born in Germany, but spent most of his life in America. Though his canvases do not have the highest artistic merit, they possess a grandeur and impressiveness that make them wonderfully effective. His *Sierra Nevada* may be viewed in the Corcoran Art Gallery in Washington, D. C.; his *Valley of Yosemite* is in the James Lenox collection in New York. The Capitol at Washington contains two historical pictures painted by him—*The Discovery of the Hudson River* and *The Settlement of California*. Bierstadt was awarded several German and Austrian decorations, and was a member of the National Academy of Design of New York.

BIFOCALS, *bi fo' kalz*, divided lenses. See SPECTACLES.

BIGAMY, *big' a mie*, in law, the crime of marrying a second time while a first husband or wife is living and not legally divorced. The Roman Catholic Church formerly regarded a second marriage as bigamous, even though the first spouse were dead, the first marriage being considered a sacrament that was binding on each of the persons for life; however, that Church now recognizes the right of the survivor to wed again, when the first marriage has been broken by death; but divorced persons in the Roman Church may not remarry. In most countries, the government recognizes a properly granted divorce as sufficient authority to remarry. If a person remarrying can prove that he or she is unaware of the fact that a former husband or wife is living, and has had no such knowledge for seven

years, the law does not now consider remarriage in such circumstances as bigamous.

In England, until about 1700, bigamy was a crime punishable by death. The penalty was reduced in the time of George I to a minimum of two years' imprisonment, with hard labor. Canadian laws concerning bigamy are based on those of England. In the United States, the punishment is usually a term of imprisonment, varying from two to five years, sometimes accompanied by a fine.

"BIG BEN," the name given to the great bell in the clock tower of the Parliament building in London. See BELL (Famous Bells).

BIG BLACK MOUNTAIN. See KENTUCKY (Physical Features).

BIG BLACK RIVER. See MISSISSIPPI (Physical Features).

BIG DIPPER. See CONSTELLATION; ASTRONOMY.

BIG HOLE BATTLEFIELD. See MONUMENTS, NATIONAL.

BIGHORN, the wild sheep of North America, so named from the massive horns of the ram. These curve back from the forehead, down, and



THE BIGHORN

Photo U & U

then forward, and frequently measure forty inches in length and seventeen inches in circumference. The length of the horns is approximately that of the height of the animal at the shoulder. The typical bighorn ranges along the higher Rocky Mountains, from British Columbia to Arizona, but there are several local forms, varying in color from the pure-white Dall Mountain sheep of Alaska to the black sheep of the Stikine district of Northern British Columbia. The typical bighorn has a grayish-brown coat, with face of a lighter shade, a dark line down the spine, and two white patches on the rump. The under parts are also white.

These animals live in herds of thirty or forty, and are quick and nimble; they jump and climb easily in the most dangerous places. No other animal, not even the chamois, has more agility than the bighorn. In the Rocky Mountains National Park, in Colorado, herds of these wild sheep, even the lambs, sometimes plunge down steep slopes hundreds of feet high, breaking their fall at intervals by landing on their four feet held tightly together, then repeating their leaps until, safe from their enemies, they reach the valley below. Though the bighorns are at home in the least accessible regions, they have been slaughtered to such an extent that their protection has been urged by various agencies interested in the preservation of wild life. W.N.H.

Scientific Name. The typical bighorn is known as *Ovis canadensis*. It belongs to the family *Bovidae*. See SHEEP.

BIGHORN RIVER, the largest southern tributary of the Yellowstone River. It rises in the Wind River Mountains of Central Wyoming and flows in a northeasterly direction for a distance of 450 miles, through Wyoming into Montana. Its course is through scenic, mountainous country, along the former home of the Sioux Indians. The stream is navigable as far as Fort Custer, near the scene of the Custer massacre in 1876.

BIGLOW PAPERS, two series of humorous and satirical poems which at two critical times in the nation's history made James Russell Lowell not only a popular poet but an important figure in the life of the country (see LOWELL, JAMES R.). The first, relating to the Mexican War, appeared in 1848; the second, dealing with the War of Secession and reconstruction, in 1867. Both were signed with the fictitious name of Hosea Biglow. Hosea, who wrote in Yankee dialect, possessed all of New England's clear-headedness and sharpness. "Editorial matter" by a fictitious Homer Wilbur reinforced the poems.

Extracts. The following quotations, among many others, have made a permanent place for themselves in American literature:

This goin' ware glory waits ye haint one agreeable featur.

I don't believe in princerples
But oh I du in interest

An' you've gut to git up airly
Ef you want to take in God.

BIGNONIA, *big no' ni ah*, the common name for *Bignoniaceae*, a family of plants consisting both of shrubs and trees which bear showy, trumpet-shaped flowers and are native to warm climates. One of the most interesting members of this family is the *trumpet flower*, or *trumpet creeper*, which is found in the United States from New Jersey and Pennsylvania westward to Illinois and south to the

Gulf states. This plant exists in moist woodlands and fields, where its stem creeps along the ground or climbs over fences and bushes, and often finds its way up the trunks of small trees. Because of its excellent climbing qualities, the trumpet-creeper is cultivated as a porch vine. The beautiful, trumpet-shaped flowers are red within and tawny or orange outside, and are the favorite blossom of the humming bird; in order to reach the nectar, this little bird must thrust its tiny head and shoulders well into the long tube.

Another species of bignonia found commonly in the woodlands of Southern United States is the *cross vine*, a shrub with a high-climbing stem and numerous flowers which are yellow within and reddish-brown without. This plant takes its name from a curious formation in the stem, a cross-section of which shows a conspicuous cross. The familiar *catalpa* tree (see CATALPA) is also a member of the bignonia family, as are also many beautiful tropical vines. B.M.D.

Scientific Names. The botanical name of the trumpet flower is *Campsis radicans*, of the cross-vine, *Bignonia crucigera*.

BIG SANDY RIVER. See KENTUCKY (Its Rivers).

BIG THOMPSON CANYON. See COLORADO (The Rivers).

BIG SIOUX RIVER. See SOUTH DAKOTA (Rivers and Lakes).

"BIG TREES." See CALIFORNIA (Distinctive Plants); SEQUOIA.

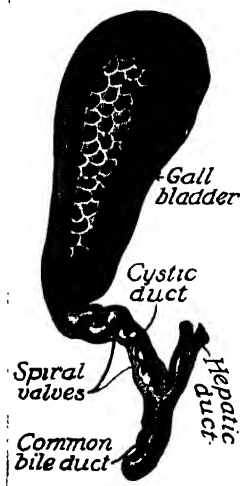
BILDAD, one of Job's advisers. See JOB.

BILDERDIJK, *bil' dur dik*, WILLEM. See NETHERLANDS, THE (Language and Culture).

BILE, a bitter greenish-yellow fluid of thick consistency, is one of the most important digestive juices. It is formed largely in the liver, but recent investigation has shown that other cells, the so-called reticulo-endothelial cells, help

in its formation. It is both a secretion and an excretion, serving as one of the important digestive juices in the small intestine. With it, certain waste products pass from the body.

From a pint to a quart of bile is secreted each day by a healthy liver. Secretion goes on



The gall bladder and bile ducts, longitudinal section.

continuously, and when not needed for digestion, the fluid is stored in the gall bladder, a small sac on the under side of the liver. It is conveyed to this sac through the hepatic and cystic ducts, which unite to form the common bile duct. During digestion, bile flows through the common bile duct into the duodenum, the first section of the small intestine. In some instances, because of the presence of inflammation or gall stones in these ducts, the bile is not allowed to flow into the intestine. It is absorbed into the blood stream, instead, and circulates through the body until it is deposited in the skin. It then imparts to the skin a yellow color of varying intensity. This condition is known as *jaundice* (which see).

The presence of bile aids digestion in the following ways:

- (1) It aids in the digestion and absorption of fats in the small intestine
- (2) It limits, to a slight extent, the decomposition and putrefaction in the intestinal tract
- (3) It aids in excreting certain waste products from the body.

K A E.

Related Subjects. The articles on the following topics contain information that will be helpful in this connection

Digestion	Jaundice
Gall Bladder	Lacteals
Intestine	Liver

BILHARZIA, *bil hahr' zih ah*. See ZOÖLOGY (How Zoölogy Affects Human Welfare).

BILIOUSNESS, *bil'yus nes*. See AUTO-INTOXICATION.

BILL. When the men of the Middle Ages wrote an important document they closed it with a leaden or other seal called a *bull*. Gradually the word came to be applied to the paper itself, and in England and France the similar words *bill* and *billet* were applied to less formal writing, as well. As a result, Anglo-Saxons have at the present time several widely different sorts of written or printed papers which are called *bills*. Besides the bills of attainder, of exchange, of health, of lading, of rights, and of sale, each of which is described in the succeeding pages of this volume, the most important forms are the following:

In Bookkeeping. When a promissory note is received by the proprietors of a business, or a draft or bill of exchange in their favor is placed in their hands, the bookkeeper records them on his books as *Notes Receivable*. Notes given or drafts accepted by the firm are *Notes Payable*.

In Commerce. Besides the formal statement of money due, a bill with which everyone is familiar, there is the invoice, or bill of goods, which contains a list of goods sold, with the price of each item; it is commonly sent out at the time of a sale. The usual form of invoice is here shown:

Cleveland, Ohio

June 10, 1946.

T Campbell, Esq.,
Bay City, Mich
Bought of MATTHEWS Co.

Terms 60 days

100 bbls Baldwin apples	@ \$2.04	\$204.00
50 bbls. Northern Spies	@ \$2.86	143 00
		<hr/> \$347.00

Shipped Grand Trunk.

In Law. When anyone is formally accused of crime, in accordance with legal procedure, the written statement detailing the charge is known as a *true bill*, or a *bill of indictment*. There are several other types of formal statements in legal practice which are called bills.

In Lawmaking. When we read of the Jones Bill or the Smith Bill being offered in one branch of Congress, we know that a statute has been proposed by a Representative or Senator of that name. Later, if it becomes law, it will be termed an *act*. In the article LAW will be found a diagram showing how a bill becomes a law.

F.H.E.

Related Subjects. The reader is referred in these volumes to the various kinds of bills named in the first paragraph above, and to the following, in connection with the four subheadings

Bookkeeping	Jury
Bull	Law
Indictment	Note

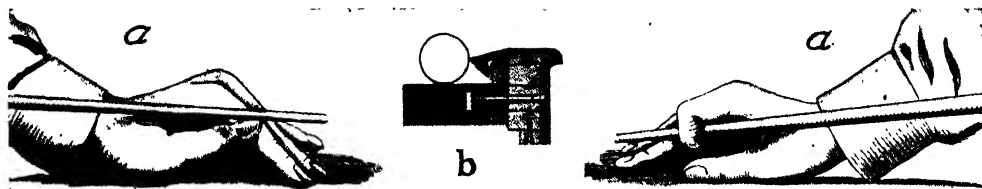
BILLBOARD. See ADVERTISING (Outdoor).

BILLFISH. See GAR.

BILLIARDS, *bil'yardz*, a popular indoor game played on a rectangular table with three ivory balls, which are driven against one another by means of a rod called a *cue*. Billiards is a scientific game, requiring much skill and practice. Like many other games, it has won the attention of enthusiasts who have become professional players. So skilful are many of them that special rules have been devised as handicaps. The average amateur, however, finds ordinary billiards sufficiently difficult.

Before the game begins, the players *bank for the lead*; this is done by driving the cue ball against the end cushion so that it rebounds toward the other end. The player whose ball approaches nearer to the head cushion on the rebound has the choice of playing first or of allowing his opponent to play first. One of the balls is red and two are white, but one of the white is distinguished by a black spot. The cue balls are the white ones, and are used in rotation throughout the game. If any player uses the wrong ball, he is usually penalized by the loss of his turn.

To begin the game, the red ball and one of the white balls must be placed on the two spots near the ends of the table. The red ball is placed on the spot at the foot of the table, and one of the white balls at the head. The



IN THE GAME OF BILLIARDS
(a) Position of left or right hand, showing bridge; (b) cushion and ball

first player places his cue ball anywhere on the table back of, or to the side of, his opponent's white ball. He then tries to hit the red ball at the other end of the table in such a way that his cue ball will rebound and hit the third ball. If he succeeds he makes a *carom*, or *billiard*, and scores one point. He may then drive his ball at either of the others, and may continue to play until he misses a carom. Then his opponent, driving his own ball at either of the others, plays until he misses. The players shoot alternately until the game is ended. The points to constitute a game are decided upon before playing, fifty or one hundred being a score often favored. There are several variations of the game, and even the game of billiards proper is counted in various ways and has numerous rules and hazards.

The Table. Billiard tables are made in many sizes, but the size generally used is four feet six inches wide and nine feet long. In championship games between professionals, a table five feet wide and ten feet long is



A BILLIARD TABLE

sometimes used. The bed of the table is a tablet of slate or marble, covered with a fine green broadcloth. At the sides and ends of the table there are cloth-covered rubber cushions, from which the balls rebound. Billiards may also be played on tables with pockets at the corners and at the middle of the sides, but this style is usually reserved for pool (which see).

The Cues. A good billiard cue, made of ash or maple, should weigh about a pound, though the heavier cues weigh from twenty to twenty-two ounces. The handle, or butt end, is about an inch and one-half in diameter, and the cue tapers down to a tip from one-fourth to one-half inch in thickness. The small end is tipped with leather, to give a "jump" to the ball.

The billiard player's success depends chiefly

upon the proficiency of his stroke. The two principal positions for holding the cue are shown in the illustration *a*. The cue is held in the right hand between the fingers and the thumb, and is guided by the left hand, which is placed upon the table, with finger tips and wrist forming a bridge.

Billiard Balls. The best billiard balls are made of solid ivory, but cheaper ones are of various composition. When an ivory tusk reaches the manufacturer, it is carefully examined for flaws. If it is perfect, it is sawed into blocks; these are cut into a roughly spherical shape, and laid aside for six months to dry. Lastly, they are chiseled smooth and polished by machinery. See **IVORY**.

Cheap grades of billiard balls are sometimes made of ivory sawdust and shavings which have been treated with chemicals and molded by hydraulic presses. The process of manufacture is so nearly perfect that only an expert can distinguish the composition from the solid ivory, in appearance.

BILLINGS, JOSH, the pen name of HENRY WHEELER SHAW (which see).

BILLINGS, MONT. See MONTANA (back of map).

BILLINGSGATE. See ENGLAND (Fisheries)

BILL NYE, the pen name of Edgar Wilson Nye (which see).

BILL OF ATTAINDER. See ATTAINDER.

BILL OF EXCHANGE, a written order by one person directed to another person, requesting him to pay to a third a certain sum of money. The word *person*, as used in this case, may refer to an individual, a bank, or any other corporation. The writer of the bill of exchange is called the *drawer*, or *maker*; the person who is asked to pay the fixed sum is the *drawee*; the person to whom the money is to be paid is the *payee*.

Technically, there is not the slightest difference between a bill of exchange and that commercial paper which is known as a *draft*. Common usage, however, has in a measure established slightly different meanings; so today when a bill of exchange is correctly referred to, it means a draft drawn by a person of one country upon a drawee in another country; in such case the word *exchange*, while it retains its ordinary meaning of transfer of money, is also significant of the value of money of one

country in terms of the other country's monetary unit. In explanation of the latter statement, we speak of the *rate of exchange* between the United States and England as being \$4.86 for £1. Accepting this view of a bill of exchange, a *draft* then becomes an order for the transfer of money between people of the same country. In the days before the term *draft* became current, bills of exchange were termed either *foreign* or *domestic*.

Form of a Bill of Exchange. Only in one respect does the form of a foreign bill of exchange differ from the ordinary draft. Triplicate copies are made in the interest of security, because of long distances required for transmission and dangers incident thereto. The first, or original copy, is sent to the payee; the second is for the purpose of presentation to the drawee; the third is retained in the hands of the drawer. The wording of the first, or original copy, may be as follows:

\$500

New York, N. Y., Dec 22, 1945

At sight of this first of exchange (second and third unpaid) pay to William Jones, or order, five hundred dollars (\$500), for value received, and charge to the account of

JOHN KNIGHT

TO LESTER MORGAN, London, England

As soon as the drawee has honored the request made upon him by paying the amount demanded, the other two copies of the bill automatically become null and void. F.H.E.

Related Subjects. Further particulars of laws relating to bills of exchange will be found in the articles **DRAFT**; **BANKS AND BANKING**

BILL OF FARE. See **NUTRITION**.

BILL OF HEALTH, a certificate signed by port authorities, certifying the state of health of a ship's crew and passengers at the time the ship sails. If no infectious disease is known to exist, the master of the vessel receives what is called a "clean bill of health." A "suspected bill" is given when disease is feared, and a "foul bill" when it is known to exist. At the port of arrival, the vessel is held in quarantine (which see) until the state of health of those on board is ascertained.

Another Meaning. A "clean bill of health" is now often used to indicate that a person suspected of some wrongdoing has been found guiltless

BILL OF LADING, a written receipt for goods consigned to a common carrier for shipment, either on land or sea. It is not merely a receipt for the goods to be transported, but it is a contract between the shipper and the carrier, by which the latter agrees, for a stated consideration and under specified conditions, to deliver the goods to their destination. The term was originally applied only to agreements made with shipowners or captains, but now it is also given without distinction to receipts

issued by other common carriers. Such receipts issued by railways are sometimes called *way bills*.

A bill of lading states the name and address of the shipper or consignor, and the name and address of the consignee, who is the person to whom delivery is to be made. It names the railway or railways over which shipment is made; on the sea, the name of the ship and of the company which owns it are necessary. The goods should be described as accurately as possible, the number of cases or packages and the character of the contents being noted. If there are numbers or other marks of identification, these should be recorded. Furthermore, it is customary to state the value of the shipment, as sometimes the charge for transportation is based partly on value and partly on weight or bulk. The charges for transportation, whether paid in advance or payable on delivery, must be mentioned.

A bill of lading has some of the characteristics of a negotiable paper. While the goods are in transit, the owner may endorse the bill to a purchaser, who assumes, in law, all the rights and responsibilities of the original consignee. Goods in transit cannot themselves be transferred, but ownership in them may be changed by a transfer of the bill of lading. Only the owner of the goods, however, may endorse it. One who finds or steals a bill, even though the document is endorsed in blank or to bearer, cannot claim title. See **COMMON CARRIER**. F.H.E.

BILL OF RIGHTS, a phrase used rather loosely to mean an enactment or agreement setting forth some fundamental right of the people. When the term is used without modification or explanation, the reference is usually to the English Bill of Rights of 1689. When William and Mary came to the throne in 1688, they were forced to assent to a Declaration of Rights, which guaranteed the principles of political liberty now established in the English system of government. It is one of the great instruments on which the English constitution rests, the others being the Magna Charta and the Petition of Rights (which see).

Most of the states of the United States have in their constitutions bills of rights, which make clear just what the state may or may not do, and which define the inalienable rights of the citizens. Because the first ten amendments to the Constitution of the United States, proposed by the first Congress which met after the adoption of that instrument, had as their object a more definite statement of the rights of the citizens, they have received collectively the name of "American Bill of Rights." The enactment of these amendments had been promised at the hands of the First Congress; it is possible that the new American states

would not have ratified the Constitution in the form in which it was presented in absence of such an understanding. F.H.E.

BILL OF SALE, a formal statement of the sale or transfer of personal property. There is a recognized legal form in which a bill of sale should be written, which may be purchased at any stationer's store. However, any clear and definitely written statement of transfer of rights and interest in fully described property is accepted as legal evidence of sale. A bill of sale is often given to a creditor as security for borrowed money; it empowers the receiver to sell the goods named in it if the loan is not repaid at the appointed time. The following is an acceptable form:

Know all Men by These Presents, That I, James Brown, of Springfield, Ill., in consideration of Eight Hundred Seventy Dollars (\$870), the receipt of which is hereby acknowledged, do hereby grant, sell, transfer, and deliver unto John Howard the following property, to-wit

Six Horses	@ \$100	\$600
Two Buggies	@ 90	180
Two Harness	@ 25	50
Two Plows	@ 20	40
Total		\$870

To have and to hold the said goods and chattels unto the said John Howard, his executors, administrators, and assigns, to his own proper use and benefit forever. And I, the said James Brown, do avow myself to be the true and lawful owner of said goods and chattels, that I have full power, good right, and lawful authority to dispose of said goods and chattels in manner aforesaid; and that I will warrant and defend the same against the lawful claims and demands of all persons whomsoever.

In witness whereof, I, the said James Brown, have hereunto set my hand this 12th day of June, 1945

JAMES BROWN

(Witness) John K. Adams

BILOXI, *bil ok' sic*. MISS See MISSISSIPPI (back of map); IBERVILLE, PIERRE LE MOYNE; MISSISSIPPI (History).

BIMETALLISM, *bi met' al iz'm*, a monetary system in which two metals, gold and silver, are legal tender for any amount. The ratio of value between the two metals, under such a system, is fixed either by law, if the system is confined to a single country, or by international agreement, if it applies to several nations. The supporters of bimetalism argue that fixed legal ratio will prevent nearly all fluctuation in the prices or market values of the two metals. If this were true, the prices of commodities would become practically stable, and foreign exchange would be greatly simplified, whether other countries used a single or a double standard. See LEGAL TENDER.

The opponents of bimetalism, who now include nearly all economists, assert that the arguments for such a system are false. They claim, and point to the history of money as proof, that the cheaper metal will drive the

dearer from use (see GRESHAM'S LAW). An example taken from America's experience will make their point clear. In the United States in 1896, the Democratic party platform demanded the "free and unlimited coinage of silver at the ratio of 16 to 1." As a matter of fact, silver in 1896 was not worth 16 to 1, and its market price later fell to 25 and even 30 to 1; that is, it required thirty ounces of silver to buy one ounce of gold. If the Democrats had won the election of 1896, free silver coinage would probably have been established. Before many years, all the money of the country in circulation would have been silver, for fifty cents worth of silver, bought in the open market, could then have been exchanged at the mint for a coin stamped one dollar. Gold would have been withdrawn from circulation, for a dollar's worth of gold could have been exchanged intrinsically for two dollars in silver. The opponents of bimetalism further argued that even if the system were logical, and if both metals remained in circulation, there was no proof that the fluctuating prices of commodities would become stable. The total output of the precious metals might fluctuate as much as the output of one alone.

Bimetalism was for a century a political issue in France and other European countries. In the United States it was a burning issue only during the last quarter of the nineteenth century. This was an era of falling prices, of industrial depression, and of lack of work. The industrial and agricultural classes seized on bimetalism as a remedy for the nation's ills, not because they were sure it was right, but because they felt that the gold standard was wrong. The discovery of new sources of gold supply in various parts of the world was followed by a gradual rise in prices, which removed the cause of complaints. Bimetalism is now a dead issue, not because its theories were entirely disproved, but because there is no need for it. See MONEY.

BI'NARY COLORS. See COLOR.

BINARY SYSTEM. See STAR (Stars in Space); ASTRONOMY (What the Heavens Contain); DOUBLE STARS

BINDER TWINE, the string with which grain in the harvest fields is fastened into bundles by mechanical binders. Because of the almost universal employment of machinery in wheat fields, a failure in the supply of twine at any harvest would mean the loss of millions of bushels of the grain from which the world's bread is made.

About ninety per cent of all binder twine is made from the leaf fiber of *sisal* (which see). Nearly all of the rest is spun from the fiber of the manila tree, a banana-like plant of the Philippines. Though twine-manufacturing companies have spent time and money on agricultural experiments in the attempt to find

a substitute for manila or sisal which will grow in the United States or Canada, they have not yet found one which resists insects. About 325,000 tons of sisal are needed each year for the twine of Canada and the United States.

Almost all binder twine is made entirely by machinery. Combs traveling on a belt pick out the foreign matter in the sisal and straighten the fibers, delivering them in a loose but continuous coil. A length of this coil is placed in a receptacle in front of each spinning machine, to which it is automatically fed. This machine takes just enough fibers to form the proper-sized strand, and twists them into a firm twine. The balling machines then finish the work.

BINDWEED, the common name of the typical genus of the morning-glory family, is ordinarily applied to certain weedy plants of the genus. One of the best-known of these is the *hedge bindweed*, or *wild morning-glory*, found commonly along the roadside, trailing over walls, or on the edge of the woods, both in Europe and throughout the Middle and Eastern United States and lower

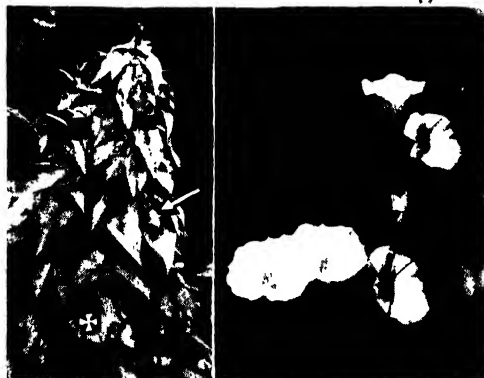


Photo Saint Clair

BINDWEED

The plant in the picture at the left has smothered a grape trellis; two of the grape leaves which remain visible are marked. At right, the bindweed blossom. This flower is highly praised by designers, a fact also true of the leaf. A cross section of the flower is shown, also a seed case.

Canada. It is sometimes planted as a trellis cover. The stem is somewhat hairy, and grows from three to ten feet long. The blossoms are white or pink-tinged, and have the shape of a funnel with a flaring mouth. The tubes of these flowers are so long that only long-tongued bees and other insects can reach the stores of nectar within. See **MORNING-GLORY**.

The *field bindweed* is a troublesome weed that came from Europe; it now grows from Nova Scotia southward to the Gulf of Mexico and westward to the Pacific. It is especially a pest in Western Kansas. The stem is rarely

more than two feet in length, but it trails along the ground in the fields of the farmer with a persistency that makes it anything but a welcome visitor. If the weed is kept from going to seed, and the land is cultivated in the late fall, the plant may be controlled in a few seasons. Kerosene oil applied to the roots will kill the plant. B.M.D.

Scientific Names. The bindweeds belong to the genus *Convolvulus*, family *Convolvulaceae*. The hedge bindweed is *C. sepium*, the field bindweed, *C. arvensis*.

BINET-SIMON TESTS. See **MENTAL HANDICAPS** (Mentally Deficient Children); **MENTAL MEASUREMENT** (The Measurement of Intelligence).

BING'EN. See **GERMANY** (Principal Cities).

BING'ERVILLE, capital of the Ivory Coast (which see).

BINGHAMTON, *bing' am tun*, N. Y., the county seat of Broome County, is in the south-central part of the state, 215 miles northwest of New York City and eighty miles south and east of Syracuse. It is attractively situated at an altitude of 867 feet, at the junction of the Susquehanna and Chenango rivers, which are crossed by several bridges within the city limits. The greater part of Binghamton stands on land once owned by William Bingham, a Philadelphia merchant. In 1800 his agent, Joshua Whitney, started to found a community "in which trades, industries, and arts would flourish." It was incorporated into a city in 1867. Population, Federal census, 1930, 76,601.

Railroads. The city is on the Erie, the Delaware & Hudson, and the Delaware, Lackawanna & Western railroads, interurban and motorbus lines connect with various suburbs.

Industry. In what is known as the Triple Cities, Binghamton, Johnson City (two and a half miles distant), and Endicott (nine miles distant), there are more than 250 widely diversified industries. Binghamton has factories for the making of shoes, cigars, cameras, furniture, machinery, and many other products. J.K.I.

BINOCULAR, *bin ok' u lahr*. See **FIELD GLASS**; **MICROSCOPE**.

BINOMIAL, *bi no' mi al*, in algebra, a quantity consisting of two terms, connected by the sign + or -; thus $a+b$ or $a-b$ is a binomial. Either term of a binomial may itself contain two or more numbers, as $(x+y)-(y-x-z)$. One of the most interesting and important formulas in all algebra is the *binomial theorem*, perfected by Newton, by which a binomial may be raised to any power. See **ALGEBRA**. J.W.V.

BIOCHEMISTRY, *bi o kem' is tri*, also known as **BIOLOGICAL CHEMISTRY**, or **PHYSIOLOGICAL CHEMISTRY**, is the science that deals with the chemical character of the substances of which all living things are composed, and also with the chemical changes that are a part

of the life processes of animals and plants; it is therefore a branch of biology. It differs from physiology only in that it deals with the phenomena of life principally from the standpoint of chemistry, whereas physiology proper does so principally from the standpoint of the science of physics. Both have for their object the attainment of exact knowledge concerning the processes by which living beings exist. There is, therefore, no sharp distinction between them. Biochemists often work with the methods used by physiologists, and physiologists often employ the methods of chemists.

Divisions. In general, biochemistry may be divided into the biochemistry of animals and the biochemistry of plants. Included in the biochemistry of animals is so-called medical chemistry—the chemistry of nutrition, or metabolism, and the chemistry of diseased animals, or pathological chemistry. Included in the biochemistry of plants are the chemistry of fermentation, agricultural chemistry, and soil chemistry. Soil chemistry, however, is not wholly biological, for the soil consists in part of mineral matter, and in part, of organic matter contributed by the innumerable minute animals and plants, living and dead. Soil chemistry, therefore, can only be studied adequately with the aid of biochemistry.

Biochemistry, both of animals and plants, consists of two sorts of knowledge. The first is knowledge of the chemical structure and nature of the substances of which living things are composed; the second is knowledge of the chemical processes that take place in them.

Substances in Animals and Plants. In animals and plants there are literally thousands of quite distinct and different substances. Though biochemists have studied them for many years, complete knowledge concerning their character has not yet been obtained. There are innumerable substances the chemical structure of which is as yet quite unknown. The principal classes of substances that occur in animals and plants are carbohydrates, fats, and proteins. In addition, there are also innumerable other substances, including mineral salts of various kinds; organic bases; acids; alcohols; terpenes, such as are found in rosin, turpentine, and similar plant products; volatile oils, such as are found in fragrant plants and those with special aromas; and many other classes of substances.

The carbohydrates are composed of carbon, hydrogen, and oxygen. Their commonest representatives are sugars, like grape sugar (glucose, dextrose), fruit sugar (fructose, levulose), malt sugar (maltose), milk sugar (lactose), cane or beet sugar (sucrose). Included among the carbohydrates, also, are starch and glycogen (animal starch), gums, and also cellulose, the principal constituent of woody plant structures.

The fats are compounds of glycerin with fatty acids. The commoner fatty acids found in fats are lauric, myristic, palmitic, stearic, oleic, linolic, and linolenic acids. Three molecules of acid are combined with one molecule of glycerin in fats; hence, fats are also known as *triglycerids*. There also occur more complex derivatives of the fats known as *lipoids*. These, as a rule, contain, in addition to fatty acids, phosphoric acid and nitrogen.

The proteins are very complex substances containing carbon, hydrogen, nitrogen, oxygen, and sometimes also phosphorus, sulphur, and iron. Their chemical nature is not as thoroughly known as that of most carbohydrates and most fats. The proteins of each species of animal are characteristic of that species, and are found nowhere else. This is true neither of carbohydrates nor of fats. Glucose and sucrose, for example, are found in many different organisms, and are always the same substances. This is also true of any given triglycerid. A protein is therefore said to be specific, that is, found only in a given species of animal or plant. Fats and carbohydrates are non-specific; that is to say, a given carbohydrate or triglycerid is often found in more than one species.

In animals, the principal part played by carbohydrates is to furnish the energy needed for the animal's existence. The carbohydrate consumed in the food is oxidized, that is, burned, thereby releasing energy which is used for the animal's life processes. One gram of carbohydrate furnishes about four calories of heat.

The rôle of fats in animals is to furnish a reserve of energy. Also in many animals, fat, especially under the skin, serves to insulate the animal and protect it from cold. When they are utilized to furnish energy, fats are also oxidized, and yield about nine calories of heat per gram.

Proteins serve a dual rôle. They furnish the animal with necessary structural material, since proteins are the characteristically essential substances of living matter. There is no living matter that is not composed, in substantial proportion, of protein. They form the principal tissues that give animals their form and mechanical strength—for example, tendons, cartilage, skin, elastic and connective tissue. With mineral salts, they form the principal constituent of bones. In addition, proteins may be oxidized to furnish energy, about four calories per gram. The principal end-products of their oxidation in organisms are carbonic acid, water, and urea.

The Derivation of Energy. Animals derive all the energy required for their existence from their food, principally carbohydrates, fat, and protein. If more food is taken in than is at the moment required, a small portion of

it is stored up as glycogen, a larger proportion as fat. Conversely, when the energy taken in through the food is insufficient to meet the animal's requirement, first the glycogen is used up to make good the deficiency, and then the fat. The animal retains its protein tenaciously, only burning it up in the later stages of starvation, when the reserve of energy in the form of fat approaches exhaustion. Since the protein makes up the essential parts of tissue and organs, in this stage of starvation the animal is burning up itself.

Plants, unlike animals, do not derive potential energy, as such, from their food. The energy of green plants comes directly from the sun. With the aid of a green pigment, chlorophyll, they reduce the carbonic acid of the atmosphere, combine the reduction product with the constituents of water, and form sugars. In the molecule of the sugar is stored a portion of the solar radiation, some of the light of which the plant has used in producing the sugar. This process is known as *photosynthesis*. It is the basis of all animal life, for animals, not being able to use directly the energy falling upon the earth from the sun, obtain their requirements by consuming vegetable food in which plants have locked up as potential energy some of the solar radiation. Even carnivorous animals depend in the last analysis upon the energy made available by plants, for they live upon the flesh of herbivorous animals, which in turn live upon vegetation.

Photosynthesis. The process of photosynthesis, in spite of much study, is not fully understood. It produces sugar, which is either used directly to furnish energy for the life process of the plant, or else is stored, usually in the form of starch, in roots, tubers, stems, or seeds, as a reserve supply of energy to be drawn upon by the plant in times of need. The sugar produced in the leaves of plants is not always converted into starch. A part may be converted into cellulose and other complex carbohydrates which form the structures in plants, like wood, that correspond to the skeleton, skin, cartilage, etc., of animals. While most plants store up a reserve of energy-yielding material in the form of starch, others do so by storing up other kinds of carbohydrates; for example, inulin, which is the reserve material of the Jerusalem artichoke and the dahlia. Still other plants, especially in the tropics, store up fats; for example, the coconut, the oil palm, flax, the peanut, and the cotton plant.

While the plant secures its energy by photosynthesis in its leaves, it secures the other materials needed for its growth from the soil, through its roots. These consist of mineral salts, especially salts of potassium, calcium, and magnesium. It secures the nitrogen needed either in the form of ammonium salts

or of nitrates. In this respect, it differs from animals, which must secure their requirement of nitrogen in the form of protein or protein derivatives.

How Plants Secure Nitrogen. While most plants secure their requirement of nitrogen by means of the absorption through their roots of salts of ammonia or nitric acid, there are other plants which secure their requirements with the help of certain bacteria. These bacteria are known as nitrogen-fixing organisms, because they have the power of converting the nitrogen of the atmosphere into ammonia. The process by which this is accomplished is not understood. These bacteria live upon the roots of certain plants, especially the legumes, and help to furnish these plants with their nitrogen requirement. The growth of legumes, therefore, helps to enrich the soil with nitrogen; they are used in crop rotation.

Conversion of Carbonic Acid. Green plants of all kinds, including microscopic ones, are engaged in converting the carbonic acid of the atmosphere, water, and mineral substances into the complex organic substances of which their bodies are composed. If there were no counter-forces in nature, all the carbonic acid of the atmosphere would ultimately be locked up in the bodies of dead plants, except in so far as fresh supplies of carbonic acid were furnished to the atmosphere in the gases of volcanoes and mineral springs. Life upon the earth would then cease. It goes on, nevertheless, because there are counter-forces tending constantly to decompose the organic material synthesized by plants back into carbonic acid, water, and mineral salts. These forces are represented by animals in general and by certain forms of microorganisms. Animals, by consuming plant materials, decompose the complex substances of which plants consist, and turn back to the atmosphere carbonic acid, water, and salts. Microorganisms live upon the organic materials in the bodies of dead plants and animals. By putrefaction and fermentation, they transform these substances back into the carbonic acid, water, and salts from which plants originally synthesized them.

There is thus in nature a cycle, in which green plants represent the constructive element, and animals and many kinds of microorganisms, the destructive element. The science of biochemistry endeavors to supply knowledge concerning these cycles in all their phases.

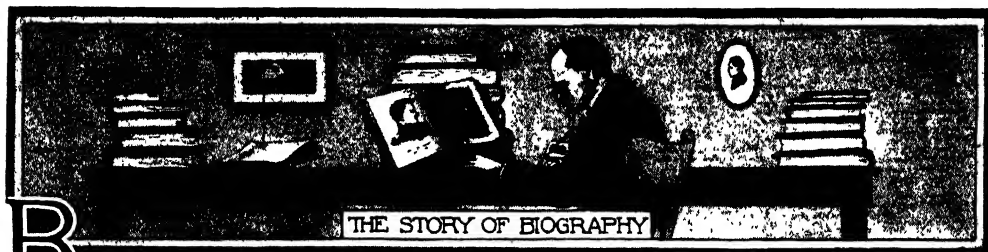
C.L.A.

BIOGENESIS, *bi o jen' e sis*. This term has two different meanings in biology. According to one meaning, biogenesis is the theory that the various changes which an animal experiences in its development from the egg to the adult condition recapitulate the history of the development of the species from simple ancestral forms (see EVOLUTION).

Biogenesis also means the doctrine of "all life from preëxisting life"; in other words, it is the belief that living organisms are all descendants of living organisms, and that they never arise from non-living matter. Until comparatively recent times, it was quite generally believed that bacteria and other microscopic forms of life arose by spontaneous generation in media (substances) favorable to their creation. Pasteur disproved this assumption by actual ex-

perimentation, and belief in spontaneous generation, or abiogenesis, was generally abandoned. To-day, however, biologists and other scientists are seriously examining the hypothesis that the first forms of life originated from lifeless matter, millions of years ago, in the early stages of the earth's history. See BIOLOGY; SPONTANEOUS GENERATION. R.H.

BIOGEOGRAPHY, *bi o je og' ra fie*. See GEOGRAPHY, subhead.



BIOGRAPHY, *bi og' ra fie*, which is derived from two Greek words meaning *life* and *to write*, means literally the written lives of men and women. It is a very important department of literature. Biographies range in length from what is probably the shortest one ever written, the Biblical "And Enoch walked with God; and he was not, for God took him," to lengthy works of many volumes which touch upon philosophy, upon science, upon history.

Development of This Form of Literature. It seems natural that biographical writing should be one of the oldest branches of literature, for there has never been a time when men have not been interested in the lives of other men; but the earliest writings of this type were very simple, like the accounts of the patriarchs in the Bible. The myths and legends of the Greeks and Romans were but brief biographies of their gods and heroes, usually written to bring out some one point of character. The more formal biography was then, as it remained for centuries, little more than an account of the happenings in the life of a man; but nevertheless, ancient Greece and Rome produced some examples of biographical writing which in their way have never been surpassed. The *Agricola* of Tacitus, for instance, is beyond criticism, while the parallel *Lives* of Plutarch have had a tremendous influence on modern literature.

The Middle Ages had little biography except the lives of saints and martyrs. These works did not strive for historic accuracy, and it was not until the seventeenth century that biography in the modern sense really appeared. That an appreciation of the influence of such writings did not take an earlier hold upon the people is much deplored, for had the sixteenth century felt the keen interest that the twentieth

does, in the lives of its poets, for instance, the world would have much valuable information which now it lacks. To-day every "idle singer of an empty day" has the minute details of his life chronicled in the magazines, and exhaustive biographies of all writers of any note are sure to appear; but of Shakespeare, the world's greatest poet, there is no biography—not even is enough known of him to make it absolutely certain that he was the author of the plays ascribed to him.

Important Biographies. Preëminent among English biographies is Boswell's *Life of Samuel Johnson*, and second, perhaps, is Lockhart's *Scott*. Forster's *Dickens*, Mrs. Gaskell's *Charlotte Brontë*, Cross's *George Eliot*, and Tennyson's *Life* by his son are all excellent examples of biographical writing. The most interesting and famous American biography is of the type known as *autobiography*—the life of a person written by himself; this is Benjamin Franklin's *Autobiography*.

Biographical material has also entered largely into the writing of fiction. Sometimes a slight sketch of some real person is introduced by an author into his novels, as when Dickens, in *Bleak House*, pictures Walter Savage Landor and Leigh Hunt as Mr. Boythorne and Harold Skimpole; sometimes an entire novel is woven about the career of the writer himself or of some person prominent in public life. Thus, Goethe wrote of himself in *The Sorrows of Werther*; Dickens made use of many of the events of his own life in *David Copperfield*; Meredith described in *Diana of the Crossways* the celebrated Carolyn Norton, a granddaughter of Sheridan, Gertrude Atherton wrote of Alexander Hamilton in *The Conqueror*; and Maurice Hewlett gave a more or less distorted picture of Lord Byron in his *Bendish*. Emil Ludwig's *Napoleon*, though classed as biography, is partially fic-

tionized. In reading books that are openly fiction, allowance must always be made for the fact that the author is not writing biography, and therefore may feel free to take certain liberties with his material.

Since the World War, there has been a pronounced element of realism in many of the biographical books published in the United States and England. Giles L. Strachey set the pace for this type of writing with his *Queen Victoria* (1921). Uncompromising realism is noticeable in two lives of Washington, written, respectively, by Rupert Hughes and W. E. Woodward, and in a life of Franklin by Phillips Russell, all published in 1926. Carl Sandburg, in his *Abraham Lincoln: The Prairie Years*, handles his subject realistically; this book is distinguished by its vivid, yet simple, style, and is a classic in its field. Among modern autobiographical books, Charles A. Lindbergh's *We* is notable as an example of direct, terse writing, without self-glorification. Mention should be made, too, of the modern tendency to emphasize the psychological aspects of the subject; a bare recital of external facts does not satisfy the biographer of to-day.

Biography for Children. If the teacher or parent of a child ever hears him say, "I don't like to read biography—I don't care for 'lives' of people," that teacher or parent may be sure that the lives have been presented to him in the wrong way. For everyone, young or old, is naturally interested in "lives"—if they are shown him from the right angle. What, indeed, are most of the stories which so delight children but biography, presented from the point of view which appeals to a child? *Bluebeard*, *Dick Whittington and His Cat*, *The Ugly Duckling*, "fairy tales" though they may be, are but biographies which the child feels should be true, even if they are not; while as regards less legendary heroes—Joseph, Daniel, David, King Arthur, the Cid, Roland—any child will listen to stories of them told over and over again, and then ask to hear them once more.

We expect a child to like stories of these heroes; we pick out the points that will strike the child's fancy, fire his imagination, hold his interest. But our attitude changes when we come to consider other men whom tradition has not marked as children's heroes. "Why," we say, "should a child be interested in the Apostle Paul? A boy or girl does not care particularly for preaching and for missionary work." And we forget that Paul had, if ever a man had, just those experiences that children love to hear about; that he was "in deaths oft, . . . in journeyings often, in perils of waters, in perils of robbers, . . . in perils of the wilderness, in perils of the sea." Or we think again, "Of course a child doesn't care to read about Dickens, or Longfellow, or Hawthorne. Of what particular interest is it to him that one man

wrote *The Tale of Two Cities* and another man wrote *The Marble Faun*?"

But even in those biographies which at first sight seem adapted only to older people, a little study will almost always reveal much that will interest a child. The "things that happen" must of course be emphasized, especially childhood events, while all moralizing must be omitted. There may be in such a biography an apparent lack of proportion, but it is simply an exaggeration of some points; it is not a distortion. As a child grows older and gradually widens his interests, he will learn other facts to join to and fill out those he has already learned; but he will not need to unlearn anything of what he has remembered.

Biography in the School. The teacher finds many uses for biography besides the merely intellectual one, for there is nothing so helpful in character-building as well-selected, well-presented biographical material. This does not mean that the admonition, "Do thou likewise," is to be given every time a forceful act or an attractive character is presented; in fact, it means quite the opposite. If the factors that made a man great or good are put impressively before him, the child will have an instinctive desire to imitate them. A knowledge of the early hardships of Dickens, for instance, and of his struggles to educate himself is almost certain to waken in a child some appreciation of his own greater opportunities; the story of Wolfe or of Washington contains a never-dulled spur toward achievement; the wonderful career of Florence Nightingale is a striking lesson in the benefits of preparation for life work. These illustrations might be multiplied almost endlessly, but every teacher and parent will have in mind heroes or heroines of his own whom he can present sympathetically to the children.

The Biography Method of Studying History. "History is but the essence of innumerable biographies," wrote Carlyle; the deeper a student delves into history the more thoroughly is he convinced that this is true. Some men seem to gather unto themselves the entire history of their times; the story of Rome in its late republican days was the story of Caesar; France for nearly a generation had almost no history save that of Napoleon; while the trend of affairs in England during a momentous period is best understood through a study of the life of Cromwell. The story of Italy for a considerable period after the World War was the story of Mussolini, and a biography of Lenin would in part be a picture of Russia under the Soviets. In other eras, no one man stands out as clearly, and it is the reaction of many less dominant figures upon each other which completes the history of such periods.

To come to concrete examples, a student might possess himself very satisfactorily of the history of the early national period in the

United States by studying the lives of Washington, John Adams, Hamilton, and Jefferson. If the history of Germany from 1860 to 1880, for instance, be the topic, it may be approached through the lives of Emperor William I, Bismarck, and Napoleon III of France. To most students, this biographical method is very interesting, for it introduces that personal touch which makes history a living subject.

How to Write a Brief Biography. No hard and fast rules can be laid down for this task, for people look at the subject from different angles, but certain general directions can be given which will be of use to school children in writing such brief biographies as they may be called upon to produce. First of all, an outline is most helpful. It need not be elaborate, but it should contain every important point which the writer intends to touch upon. The natural method in writing a biography is to proceed chronologically, and, simple as that direction may seem, it is one that is frequently overlooked by young writers. One apparent exception should be made to this rule: the great achievement of the man under consideration should be briefly noted very near the beginning of the biography, that the one who reads may know why he is important enough to deserve study. Later, that achievement may be dwelt upon more at length.

One rule cannot be too strongly insisted upon—a biography must not be a mere catalog of dates. No one finds interesting a story of a man's life which proceeds thus: "He was born in 1847. In 1853 he started to school, and in 1865 to college. He was graduated in 1860, and two years later moved to Philadelphia." That is the mere skeleton, the framework about which interesting events and anecdotes are to be grouped. Above all, one thing should be kept in mind, and that is the crowning achievement of the life of the subject; every happening, however trivial, which helped to shape the man's character or ability toward that end should be pointed out. In Nathaniel Hawthorne's life, for instance, the years spent in the Maine woods were quiet, unproductive years, but no one could understand Hawthorne's later life, his intense reserve, and his unsociable habits, without a knowledge of that formative period.

Some men's lives, from the point of view of a biographer, do not end with their death. Those classical biographies known as the *Gospels* chronicle the entire career of Jesus of Nazareth, but the account of his life is not complete without that supplementary book called the *Acts of the Apostles*, which gives the account of the carrying on of his work by those whom he inspired. Thus, the life of Dickens cannot be regarded as complete without a discussion of those humane reforms which have taken place since his death, but which he initiated.

Related Subjects. These volumes are particularly rich in biography, and to make reference to it easier and more effective, the biographical articles are all indexed. Many of them, as indicated below, are listed under special departments, the others are given here.

ACTORS

See *Drama*

ASTRONOMERS

See *Astronomy*

AUTHORS—MISCELLANEOUS

Baedeker, Karl	Ossoli, Sarah Fuller
Boswell, James	Paine, Thomas
Brandes, Georg M. C.	Pepys, Samuel
Burke, Edmund	Pliny the Elder
Butterworth, Hezekiah	Pliny the Younger
Caedmon	Proudhon, Pierre Joseph
Carpenter, Frank George	Quintilian
Chesterfield, Earl of	Richter, Johann Paul F.
Curtis, George William	Rus, Jacob A.
Custus, George W.	Roosevelt, Theodore
Dana, Richard Henry	Rousseau, Jean Jacques
Dole, Nathan Haskell	Sheldon, Charles M.
Dowden, Edward	Smiles, Samuel
France, Anatole	Smith, Goldwin
Franklin, Benjamin	Southey, Robert
Furness, Horace Howard	Spark, Jared
Gosse, Edmund	Stael-Holstein, Baroness de
Grady, Henry Woodfin	Steele, Sir Richard
Hale, Edward Everett	Stoddard, Richard Henry
Heine, Heinrich	Strabo
Holinshead, Raphael	Strachey, Giles L.
Holmes, [E.] Burton	Swift, Jonathan
Johnson, Samuel	Taine, Hippolyte Adolphe
La Fontaine, Jean de	Tarbell, Ida Minerva
Landon, Walter Savage	Taylor, Bayard
Lang, Andrew	Thomas à Kempis
Lewes, George	Voltaire
Malory, Sir Thomas	Walpole, Sir Robert
Mandeville, Sir John	Walton, Izaak
Matthews, James Butler	Warner, Charles Dudley
Mitchell, Donald Grant	Wilde, Oscar
Morley, John	Wilson, John

AVIATORS

See *Aircraft*

BUSINESS MEN AND FINANCIERS

Armour, Philip D.	Hill, James J.
Ashburton, Lord	Hirsch, Maurice, Baron de
Astor (family)	Law, John
Belmont, August	Mackay, Clarence H.
Carnegie, Andrew	Mackay, John William
Cooke, Jay	Morgan, John Pierpont
Eastman, George	Plant, Morton F.
Field, Marshall	Pullman, George M.
Field, Cyrus West	Rockefeller (family)
Firestone, Harvey	Rothschild (family)
Fish, Stuyvesant	Sage, Russell and Margaret
Ford, Henry	Schwab, Charles M.
Garv, Elbert H.	Shaughnessy, Thomas G.
Gould (family)	Stanford, Leland
Green, Hetty H.	Vanderbilt (family)
Harriman, Edward H.	Wanamaker, John
Hays, Charles M.	Woolworth, Frank W.

CARTOONISTS

See *Cartoon*

CHEMISTS

See *Chemistry*.

CHURCHMEN

See *Protestant, Roman Catholic Church*.

DRAMATISTS

See *Drama*

ECONOMISTS

See *Economics*.

EDITORS

Bennett (family)
 Bok, Edward W.
 Brisbane, Arthur
 Bryan, William Jennings
 Dana, Charles A.
 Garrison, William Lloyd
 Greeley, Horace
 Harvey, George B.
 Hearst, William R.
 Howell, Clark
 Munsey, Frank A.

EDUCATORS

See *Education*.

ENGINEERS

See *Engineering*.

ESSAYISTS

See *Essay*.

EXPLORERS

Abuzzi, Luigi Amadeo,
 Duke of the
 Alvarado, Pedro de
 Amundsen, Roald
 André, Salomon
 Balboa, Vasco Nuñez de
 Bienville, Jean Baptiste,
 Sieur de
 Boone, Daniel
 Byrd, Richard E.
 Cabot, John and Sebastian
 Cabral, Pedro Alvarez
 Cadillac, Antoine
 Carson, Christopher
 Cartier, Jacques
 Champlain, Samuel de
 Clark, William
 Columbus, Christopher
 Cook, Frederick
 Cook, James
 Coronado, Francisco Vasquez
 Cortez, Hernando
 Dawson (family)
 De Soto, Fernando
 Dias, Bartholomeu
 Drake, Sir Francis
 Emin Pasha
 Eric the Red
 Franklin, Sir John
 Frémont, John Charles
 Froisher, Sir Martin
 Gama, Vasco da
 Gilbert, Sir Humphrey
 Gosnold, Bartholomew
 Hawkins, Sir John
 Hedlin, Sven
 Hennepin, Louis

GEOLOGISTS

See *Geology*.

See *History*.

HUMORISTS

Ade, George
 Bangs, John Kendrick
 Browne, Charles F.
 Burdette, Robert J.
 Clemens, Samuel L.
 Cobb, Irvin S.
 Dunne, Finley P.
 Jerome, Jerome K.
 Jerrold, Douglas W.

INVENTORS

See *Invention*.

JOURNALISTS

See *Newspaper*.

Northcliffe, Alfred
 Charles Harmsworth,
 First Baron
 Perry, Bliss
 Pulitzer, Joseph
 Smith, Goldwin
 Stead, William T.
 Warner, Charles D.
 Watterson, Henry
 Weed, Thurlow
 White, William Allen

EDUCATORS

ENGINEERS

ESSAYISTS

EXPLORERS

GEOLOGISTS

HISTORIANS

HUMORISTS

INVENTORS

JOURNALISTS

JURISTS

See *Law*.

LABOR LEADERS

See *Labor Organizations*.

MATHEMATICIANS

See *Mathematics*.

MISSIONARIES

See *Missions and Missionaries*.

MUSICIANS

See *Music*.

MILITARY AND NAVAL LEADERS

See subhead *History*, under each country.

NOVELISTS

See *Novel*.

ORATORS

See *Oration*.

PAINTERS

See *Painting*.

PATRIOTS

See *Patriotism*.

PHILANTHROPISTS

Armour, Philip D.
 Barton, Clara
 Carnegie, Andrew
 Cooper, Peter
 Corcoran, William W.
 (Corcoran Art Gallery)
 Drexel, Anthony J.
 Gould, Helen Miller

PHILOSOPHERS

See *Philosophy*.

PHYSICIANS

See *Medicine and Surgery*.

PHYSICISTS

See *Physics*.

PIONEERS

Austin, Stephen F.
 Boone, Daniel
 Carson, Christopher

Hirsch, Maurice
 Nightingale, Florence
 Peabody, George
 Raikes, Robert
 Rockefeller, John D.
 Rosenwald, Julius
 Smithson, James (Smithsonian Institution)

POETS

See *Poetry*.

POPE

See *Pope*.

PRESIDENTS

See *President of the United States*.

PSYCHOLOGISTS

See *Psychology*.

REFORMERS AND SOCIAL WORKERS

Addams, Jane
 Anthony, Susan B.
 Bergh, Henry
 Booth (family)
 Brown, John
 Calvin, John
 Catt, Carrie Chapman
 Dow, Neal
 Garrison, William L.
 Gough, John B.
 Huss, John
 Knox, John
 Jerome of Prague

Lathrop, Julia C.
 Livermore, Mary A. R.
 Lockwood, Belva Ann
 Luther, Martin
 Melancthon, Philip
 Mott, Lucretia Coffin
 Owen, Robert
 Phillips, Wendell
 Stanton, Elizabeth Cady
 Tyndale, William
 Willard, Frances E.
 Wycliffe, John
 Zwingli, Ulrich

RELIGIOUS LEADERS

See *Religion*.

RULERS

See subhead *History* under each country.

SAINTS

See *Canonization*.

SCIENTISTS

See *Science and the Sciences*.

SCULPTORS

See *Sculpture*.

SOCIALISTS

See *Socialism*.

STATESMEN

See subhead *History*, under each country.

MISCELLANEOUS

Agrippina	Mother Shipton
Alden, John	Muller, Friedrich Max
Aspasia	Munchhausen, Baron
Beatrice Portinari	Nana Sahib
Beard, Daniel C	Octavia
Blennerhassett, Harman	Oglethorpe, James E
Blondel	Olmsted, Frederick L
Boabdil	Orleans, Dukes of
Boleyn, Anne	Pankhurst, Emmeline
Bothwell, James Hepburn	Paris, Count of
Bridgman, Laura D	Peter the Hermit
Brummell, George Bryan	Petrarch, Francesco
Buckingham, George	Petrie, William M F
Villiers, Duke of	Pinchot, Gifford
Camp, Walter	Pinkerton, Allan
Cautiline	Pitman, Sir Isaac
Corday d'Armont, Marie	Pompadour, Madame
Anne Charlotte	Queensberry, Marquis of
Coriolanus	Reichstadt, Duke of
Coverdale, Miles	Ridley, Nicholas
Cassius, Marcus Licinius	Riel, Louis
Damocles	Rienzi, Cola di
Damon and Pythias	Robin Hood
Dunwidht, Robert	Rob Roy
Du Barry, Marie Jeanne	Roland de la Platiere,
Becu	Madame
Erasmus, Desiderius	Rolle, John
Eugenie-Marie de Montijo	Rosamond
Faust, Johann	Schlemann, Heinrich
Fawkes, Guy	Selkirk, Alexander
Furnivall, F. J	Servetus, Michael
Grey, Lady Jane	Shaw, Anna H
Grotius, Hugo	Skeat, Walter William
John of Gaunt	Smith, John
Josephine, Marie Rose	Spartacus
Keller, Helen Adams	Standish, Miles
Kidd, William	Stradivarius, Antonio
kneipp, Sebastian	Stuart, Charles Edward
Kropotkin, Peter A , Prince	Tetzel, Johann
Leicester, Robert Dudley,	Turner, Nat
Earl of	Walker, William
Lycurgus	Warbeck, Perkin
Maintenon, Françoise	Warwick, Richard Neville,
Marquise de	Earl of
Maria Louisa	Washington, Martha
Marie Antoinette	Webster, Noah
Mercator, Gerard	White, Richard Grant
Morgan, Sir Henry	Xanthippe

BIOLOGICAL, *bi o loj' i kal*, **CHEMISTRY**.
See **BIOCHEMISTRY**.

BIOLOGICAL SURVEY, BUREAU OF. See
AGRICULTURE, UNITED STATES DEPARTMENT
OF.

BIOLOGY, *bi ol' o jic*. Astronomers give us almost unbelievable dimensions and figures in describing the immensity of the universe and the size and number of the stars. No less baffling to our finite minds is the smallness of the units measured by the physicist and chemist

—atoms and electrons. Yet in all our complex physical universe there is nothing so wonderful or so mysterious as life, of which we are a part. Between a minute plant or animal, so small as to be visible only through the microscope, and the highly intelligent being whose mind interprets what the microscope reveals, there seems to be a tremendous gap; but science has shown that a certain unity prevails through all living matter, in spite of the infinite variety in which life is presented to us. We learn what this unity is in studying biology.

Biology is the science that treats of things that possess life. It is well to consider here its scope. A science covering so wide a field as the foregoing definition implies cannot be studied as a single unit. Rather, biology should be thought of as a science comprising many special lines of study, and any one of these special subjects may be regarded as one of the biological sciences.

There are the two main divisions—*botany* and *zoölogy*—dealing, respectively, with plants and animals. We may break up these divisions into many subdivisions. *Morphology* and *physiology*, the study of structure and function, are fundamental in both plant and animal biology. *Palaeontology*, the study of fossils; *ecology*, the study of groups of individuals in relation to their environment; *embryology*, the study of the developing animal in the period before birth, are typical of many other branches of biological research. The special phase of biological study that has to do with man includes a number of well-defined sciences, some of those mentioned above, and others, such as *anthropology* and *eugenics*. Some scientists would include *psychology* and *sociology* in this category, for the study of the mind, and of individuals in their group relationships, is linked in many ways with the physical structure of man.

The biological sciences are readily separated from the sciences that treat of non-living matter—astronomy, geology, physics, etc.—but contrasting them in this manner naturally suggests the question, What is the difference between living and lifeless matter? This is best answered by a study of the composition and properties of living things.

The Nature of Living Matter. A tree and a bird, to cite two familiar types of plant and animal life, are made up of various parts designed to carry on activities necessary to the maintenance of life and growth. The tree has roots, heartwood, leaves, seeds, etc.; the bird lives and has its being in the functioning of its eyes and ears, skin, heart, stomach, lungs, and many other parts. These parts are called *organs*, and the individuals in which they function are known as *organisms*. Organs are made up of *tissues*—nervous, fatty, muscular, and other kinds—and tissues when examined

microscopically are seen to be composed of multitudes of tiny *cells*.

The cell is the smallest unit of living material that can maintain itself independently. Every plant and animal is either a single cell or a group of cells, and every cell in the plant and animal kingdoms is a mass of colorless, semi-fluid substance called *protoplasm*, which Huxley aptly described as the "physical basis of life." It exists in a great many varying forms, but it is chiefly a mixture of different protein compounds—carbon, hydrogen, oxygen, and nitrogen—associated with large amounts of water and small amounts of sulphur, phosphorus, and some other minerals. Protoplasm may also contain compounds of carbon, hydrogen, and oxygen, without the nitrogen, such compounds being known as carbohydrates and fats. Protein compounds, however, are the most important components of the living substance of cells.

It is a matter of general knowledge that the elements found in protoplasm are not peculiar to it. They are present also in lifeless substances, and the four leading elements are exceedingly common in nature. Water is a compound of oxygen and hydrogen; over ninety-nine per cent of the air consists of oxygen and nitrogen. Carbon is so universally distributed that it enters into more than 200,000 compounds. Protoplasm, however, is sharply distinguished from non-living matter in that its elements are arranged in a very special and definite fashion, and by virtue of this unique organization, the life substance is able to do certain things that lifeless matter cannot do (see, in this connection, the article COLLOIDS). The typical properties of living matter are responsiveness to stimuli; power of spontaneous movement; ability to assimilate food, repair wornout tissue, and throw off waste; ability to grow by virtue of the assimilation process; and ability to breathe and reproduce. These properties are easily observed in higher plants and animals, which biologists call *specialized organisms*, but the scientist can detect activities analogous to them in simple one-celled organisms, which are said to be *generalized*.

Lifeless matter possesses none of these properties. It is true that rivers flow and cut canyons through rocks; lava is ejected through the mouths of volcanoes; springs gush up from the earth; and planets revolve around the sun. There is motion everywhere in nature, but the movements of lifeless things are not caused by agencies inherent in them. They do not move of their own volition. There is no movement in non-living things analogous to the spontaneous power of locomotion possessed by most animals, the purposeful folding of the leaves of insect-eating plants, or the beating of a heart. Deltas may increase in size because

of accretions, metals may expand through heat, but such enlargements are very different from the growth of a feeding plant or animal. No non-living body breathes, and none possesses the ability to reproduce a new body like itself.

Scientific View of the Origin of Life. Scientists have suggested plausible explanations to account for the origin of the earth's rocky crust, the atmosphere, and the oceans. While they say frankly that they do not know whence came life on our planet, they have tried to construct a hypothesis based on facts. Practically all modern biologists accept the doctrine of organic evolution; they assume that the highly complex plants and animals that exist to-day represent a continuous development from simple protoplasmic organisms that came into being millions of years ago.

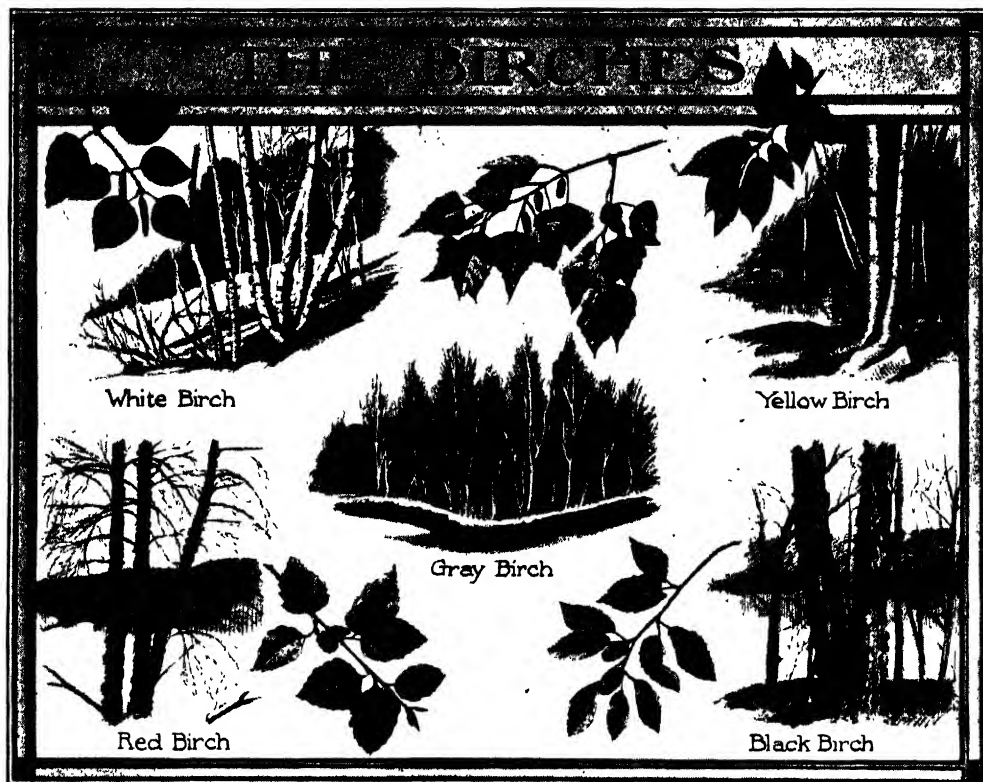
The evolutionist is concerned chiefly with the development of life once it had made a start, but his interest in this main problem does not deter him from speculating on the origin of those first primitive bits of protoplasm. Within the limits of man's observation and laboratory experience, all life has come from preceding life. What is back of the first life? Some say we are forced to believe in a special creation of primordial life. Lord Kelvin and others developed an ingenious theory that the first life germs were transported to this planet from outer space by meteorites, but this supposition leaves unsolved the origin of the life germs.

The hypothesis most acceptable to scientific minds is that living creatures of a type as simple as the simplest bacteria were evolved from non-living material, in early geologic time (see GEOLOGY), by chemical processes which scientists are striving now to reproduce. No one has succeeded in creating protoplasm in the laboratory, but biologists believe that the first steps have been taken in the artificial production of certain carbon compounds that normally are products of living organisms, such as urea, oxalic acid, grape sugar, and starch. The gap between the living and non-living may never be closed, but science is not prepared to say it cannot be. Furthermore, some observers believe it is possible that primitive forms of life are being evolved now, though the process cannot be detected. Theories such as the foregoing push back the problem about as far as human speculation can go.

R.H.

Related Subjects. Many lines of thought can only be suggested in an article of this scope. The reader will find detailed and supplementary material of great variety in the articles listed below.

Acclimatization	Biochemistry
Albino	Biogenesis
Anatomy (with list)	Botany (with list)
Animal (with list)	Breeding
Atavism	Cell



Classification
Death
Degeneration
Embryo
Eugenics
Evolution
Fauna
Fossil
Genetics
Germ
Hereditry
Hybrid

Man
Metamorphosis
Morphology
Natural Selection
Physiology
Plant (with list)
Protective Coloration
Protoplasm
Psychology
Sex Ratio
Spontaneous Generation
Zoology (with list)

BIOTITE, *bi'o tite*. See MICA.

BIRCH, any member of a family of hardy trees widely distributed in North America, Europe, and Northern Asia. The birches are notable for their characteristic bark, which is arranged in horizontal layers, and which in some species separates into thin, paperlike sheets. The flowers of birches appear before the leaves, and in spring the trees are covered with long, tassel-like clusters of staminate blossoms. The pistillates are smaller, and grow upright. Though some birch leaves seem to grow in twos, these pairs are really borne on spurlike branches of older twigs. Birch leaves all have alternate arrangement. They are at first a yellowish-green, then they turn darker, and in autumn are a pale yellow. The fruits of the trees are small, scaly cones, and the seeds are flat and winged. See SEEDS (Seed Dispersal).

Canoe Birch, or **Paper Birch**, also called **WHITE BIRCH**. This tree can be easily recognized by its yellowish-white bark, which is easily separated into thin layers. It reaches a height of sixty to eighty feet, has a few erect, large branches and many small horizontal ones. The bark of this tree was formerly used by the Indians in making canoes, and they still employ it for making ornaments and small baskets which they sell to tourists. Ladies visiting the northern woods sometimes collect it, to be used for stationery, for writing can be put upon the thin bark. This birch is found throughout North America, from the Arctic Circle southward as far as Long Island. A variety of the white birch, known as the *weeping birch*, is common throughout Scotland and England.

Yellow Birch. The yellow birch, sometimes called the *gray birch*, is a tree from fifty to seventy-five feet in height, with a broad, round top. The bark may be yellow or dark gray, but on young twigs it is silvery yellow. The thin layers often break and form loose ends, which give the tree a ragged appearance. The yellow birch is found from Newfoundland south as far as North Carolina and Tennessee, and west to Minnesota. The wood is valuable for furniture, sleigh frames, and a large number of small articles. It is one of the best of timber trees.

FROM NORTH

BIRDS

TO SOUTH



Auk



Eider Duck



Canada Goose



Snowy Owl



Stork



Pelican



Eagle



Female
Bobolink



Prairie Chicken



Ostrich



Parrot



Bird of Paradise



Condor



Albatross



Black Swan



Penguin

KATE ABELMANN

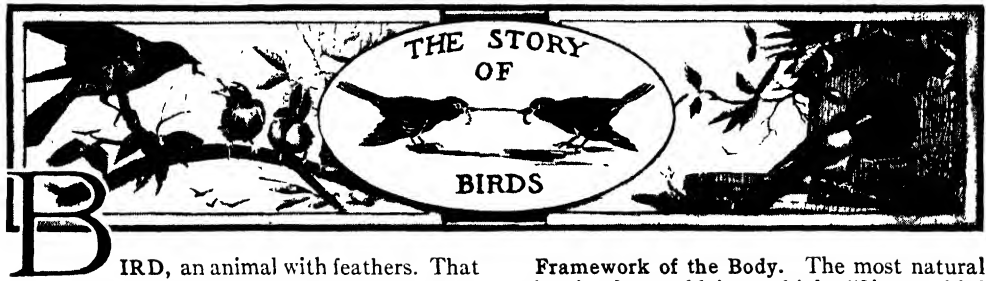
Red Birch, or River Birch. The bark of this tree is a dark reddish-brown, varying on different branches from cinnamon to silver. The red birch is a tall, graceful tree, which reaches a height of sixty to ninety feet. It is the birch of the South, and is found along rivers and in ponds and marshes from Massachusetts to Florida and west as far as Texas. When transplanted, it flourishes equally well in the Northern states.

Cherry Birch, or Sweet Birch. This species is found as far south as Florida and west to Illinois. Its branches are slender, with delicate twigs. The tree reaches a height of sixty to eighty feet, and has a beautiful, rounded top. The wood is dark brown, hard, and close-grained, and is valuable especially for furniture and interior decorations. Boys chew the twigs for the flavor of wintergreen in the sap, and

from the sap the genuine birch beer is made.

White Birch, or Aspen-Leaved Birch. This is a small, graceful tree, found along the Atlantic coast from Nova Scotia to Delaware and northwest to Lake Ontario. It rarely grows higher than forty feet; it has slender, horizontal branches and small, dainty, tremulous leaves that in shape and poise resemble those of the aspen. Its bark is chalky white or grayish, is hard and close, but can be separated into layers. Dark-colored V-shaped patches appear on the bark wherever there has been a bud or branch. The wood of the white birch is used for making spools, shoe pegs, and wood pulp, and is also valued as a fuel. G.M.S.

Scientific Names. The birch family is *Betulaceae*. The canoe birch is *Betula papyrifera*; the yellow, *B. lutea*; the red, *B. nigra*; the cherry, *B. lenta*; the aspen-leaved, *B. populifolia*.



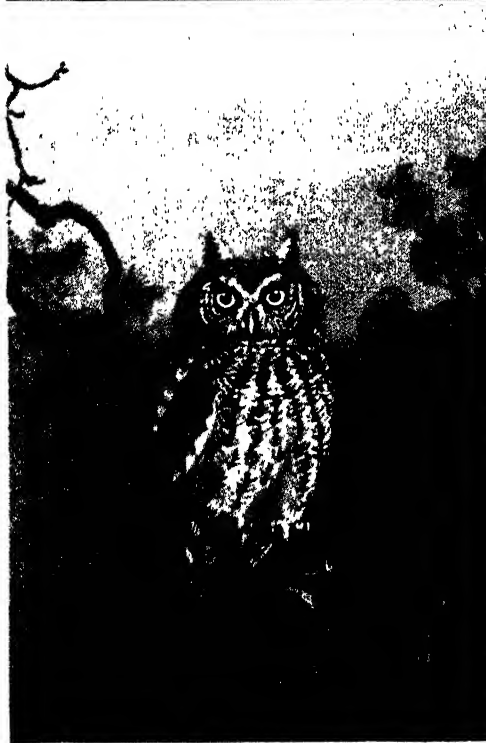
BIRD, an animal with feathers. That is the briefest description that can be given, and at the same time one which will enable a person to recognize a bird wherever it is seen. Of course, many more facts must be known if one is to have even the most general knowledge of birds—that they are warm-blooded, that each has a backbone and but two legs, and that most of them can fly. This last feature might at first seem the truly distinguishing one, but a little thought brings to mind the fact that some birds, as the ostrich, the penguin, and the curious apteryx, cannot fly; while bats, which are not birds, flying squirrels, and flying fishes do have the power of flight.

That birds have backbones shows that they belong in the great subdivision of vertebrates, for *vertebrate* means *backboned*. But it is very curious to an untrained person to learn that they are much more closely related to the reptiles than to any other living animals. There seems to be absolutely no resemblance between the brilliantly colored bird, poised lightly on tree or bush, and the venomous snake, which slips stealthily through the underbrush, perhaps intent on robbing the nest of that very bird. One is perhaps the most dearly loved by man of all the animal world; the other, the most hated and feared. Yet scientists discover resemblances in their structure, and students of fossil forms can state positively that ages ago there were bird-reptiles or reptile-birds, from which existing birds developed.

Framework of the Body. The most natural thing in the world is to think, "Since a bird can fly, its body must be light," and so indeed it is. The wing bones, though strong, are in many cases partly or entirely hollow. Everyone who has watched a housewife prepare a fowl for the table knows the shape of the breastbone, which is really a keel, to which are fastened the strong wing muscles. All birds that fly have this keel-like breastbone; the lowest classes of birds, as the ostrich, which do not have it, are called *ratilae*, meaning *keelless*, or like a flat-bottomed boat.

How Birds Breathe. Like the more highly developed vertebrates, birds breathe with lungs, and their breathing is full and rapid. In addition to its pair of good-sized lungs, a bird possesses air sacs, which are under muscular control and can be inflated or emptied at will. One of the functions of the air sacs is ventilation of the lungs. These little bags also keep a singing bird like the nightingale from getting out of breath when it is launched on a long-continued melody.

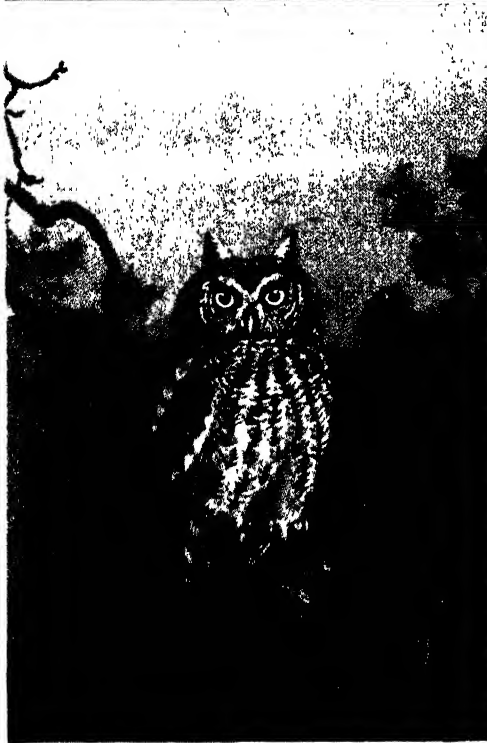
Flight. It is the modification of the fore limbs or "arms" of birds into wings which gives them their most wonderful distinction—the power of flight. From the "arms and hands" as they may be called, grow strong, heavy feathers, which make a broad surface with which the bird can beat the air; while above and below these heavy quills there are short feathers which prevent the air from passing



Courtesy: Royal Ontario Museum of Zoology

BLUEJAY
SCREECH OWL

FLICKERS
BELTED KINGFISHER



Courtesy, Royal Ontario Museum of Zoology

BLUEJAY
SCREECH OWL

FLICKERS
BITERN KINGFISHER

while—

Robert of Lincoln's Quaker wife,
Pretty and quiet, with plain brown wings,
Passing at home a patient life,
Broods in the grass while her husband sings.

Some of these mating-season coats of the male birds are gorgeous in the extreme, but many of them are shed when the nesting season is over.

Molting. Almost all birds shed their feathers at least once a year. Anyone who has had a canary or other cage bird has often watched the process, and has noticed how the best songster fails at that time to sing. It is also noted that the barnyard fowl, however well fed, will not lay eggs during the shedding or *molting* time, as it is called. The feathers do not all drop off at once, as do the leaves from a tree, to make room for the new plumage, but the old, worn feathers gradually give place to new. In some birds, the molting is partial, the wing and tail feathers remaining in place; in others, complete, those strong feathers falling also. Some birds, like the bobolink mentioned above, have a gay plumage for the mating season and a duller one thereafter—

Robert of Lincoln at length is made
Sober with work and silent with care,
Off is his holiday garment laid,

and such birds have, of necessity, two molting seasons in a year. See **MOLTING**.

Senses. As compared with other animals, birds have a very keen sense of sight. Indeed, in some species, this is little less than marvelous. A kite which has soared so high that the human eye cannot see it can often spy far below on the ground a tiny mouse, upon which it will drop with unerring aim. Sometimes, as in the owl, the sensitiveness to light is so great that the bird, even at night, is truly "lord of the dark greenwood." The eye of a bird is much like that of a human being, but it possesses certain special advantages. It has an extra eyelid, called by naturalists the *nictitating*, or *winking*, membrane, which it may draw at will.

The sense of hearing, too, is very well developed in birds; some authorities say it is much better developed than in human beings. Birds have no external ears, but the opening to the internal ears is fairly large. No better proof of this acute sense of hearing is necessary than the ease with which certain birds mimic sounds, as does the mockingbird, or learn to repeat words, as does the parrot.

The sense of taste is not highly devel-

oped in birds, nor, it is believed, is that of smell, though some birds seem to make use of this last-named sense in seeking out their food. The condor and the common buzzard, however, find their food by sight and not by smell. The sense of touch is more highly developed than taste or smell, and is located chiefly in the tip of the bill. In addition to these senses possessed by man, birds, according to some authorities, have also a so-called "sixth sense"—the sense of direction. Whatever this sense may be called, it is exhibited in a marked degree by the carrier pigeon, which will fly swiftly back to its home, even when it has been sent away by train in a wicker case. Even more remarkable is the ability of a flock of migrating birds to fly straight to the spot where they had their homes the year before, even when to reach them they must cross tracts of water which afford no landmarks. A person who has interested himself in providing homes for certain kinds of birds, as the bluebird or martin, may feel certain that each spring they will return to him. One observer writes:

My neighbor was very busy one Saturday morning putting up his ornamental bird house—"for my martins," he explained, "will arrive about the twelfth." The completed house was promptly taken over by the sparrows, but the bird-lover did not worry. On the morning of the twelfth, we heard a commotion, and sure enough, the martins had arrived and were driving the sparrows from their premises.

It is not only in this special sense, or instinct, that birds show their adaptation to the necessities of their life; there are peculiarities of structure, too. Thus, there is no danger of a perching bird falling from its twig while sleeping, for the muscles in its legs are so arranged that, when the bird perches, its toes are bent and cannot open until the bird rises again. Some birds' feet are specially made for scratching in the ground, some for holding prey, some for swimming, and the bills are equally well adapted to the services they must perform.

Song. Without their power of song, birds would not be so greatly loved, however beautiful many of them are. However, only a comparatively small number can really sing, and these are often the ones which have the plainest plumage. Almost all birds make some sound—many have a number of calls by which they make themselves understood; but no one welcomes especially the harsh *caw* of the crow,

the scream of the jay, or the hoot of the owl; their notes are jarring. However, the nightingale, the mockingbird, the thrush, the linnet, the warblers, the sky-



lark, and certain others—these are welcome everywhere; the song of the male in the mating or nesting season affords one of the greatest pleasures which all out-of-doors has to offer. Female birds do not sing. The lark, of which Shelley wrote—

Sound of vernal showers
On the twinkling grass,
Rain-awakened flowers,
All that ever was
Joyous, and clear, and fresh,
Thy music doth surpass,

and the nightingale, with its "eternal passion, eternal pain," have been most celebrated in poetry, but there are other birds which give equal pleasure to innumerable listeners.

The organ which produces the voice of birds, whether it be melodious song or discordant cry, is not the larynx, as in man, but a special organ possessed only by birds, called the *syrinx*. Man uses his tongue in his speech; a bird does not.

"Home Life" of

Birds. Birds usually live in pairs, and in some species, as the eagles and hawks, a union is for life. With the majority of birds, however, a new mating takes place each spring, and house wrens have been known to change mates during the same season. In most cases, the first act of a pair is to seek out a suitable place for a home. Most birds build nests, all those of one species making the same kind, but there are some curious exceptions to the nest-building rule (see subtitle, *Nests of the Birds*, below). In the nest the eggs are laid, for all birds without exception are hatched from eggs; and these must be kept warm until the little ones appear. Sometimes the eggs are laid in warm sand or in rotting vegetation, but the nesting birds brood their eggs, and keep them warm by their bodies. Usually, the mother bird performs this act of service, while her mate brings her food or cheers her with his song, but in some species the father bird takes his turn at brooding the eggs. In the case of the phalaropes, the male broods the eggs and takes care of the young. With most of the smaller birds, it takes from two to three weeks for the little chicks to mature and break from their shells. The number of eggs varies from

one to a score, seeming to be in proportion to the dangers which the young must later meet; the number is practically the same at every sitting of each species. See *EGG*.

With the lower orders of birds, such as the chickens and geese, and other water fowls, the young come from the shells clothed with a complete suit of down, and are able to take partial care of themselves. Within a few hours after their appearance, the fluffy chicks run about searching for bugs or grain, though they still have to be kept warm by the mother at night. The chicks of the higher orders of birds, however, are very helpless when they first come

from their shells—as helpless as is a tiny kitten or a baby. They are naked of feathers, scrawny, and apparently "all mouth"; and the frequent saying that "all young things are beautiful" certainly does not hold true of young birds.

The parent birds show the most unselfish devotion to their helpless little ones, guarding the nest from enemies at the risk of their own lives, keeping the nestlings warm at night,

and above all, providing them with the incredible amount of food which they need for growth (see subhead *Food*, below). When the time comes for the little birds to fly, the parents do not really teach them to do so, but by calling to them and withholding food from them, they induce the young to leave the nest. But a young bird often leaves the nest when the parents are absent, for a young bird flies or swims by instinct, just as a baby walks by instinct. Few members of the animal kingdom show more parental affection than do the birds. In some cases, it is but a few weeks that the little ones are so dependent, but with some of the larger birds this period may be almost a year.

Food. The food of birds varies according to the species, for like the four-footed animals, they are divided into two classes—those which eat animal food and those which exist on a vegetable diet. Many birds, however, feed on grain and insects indiscriminately. No bird has teeth, but the beak of each species is fitted to handle the kind of food which it eats, and its digestive organs are peculiarly adapted to



Photo U & U

WORLD'S LARGEST BIRD CAGE

Built on the Wrigley estate on Catalina Island, Calif., where the owner has established an 80-acre wild-bird refuge. Facilities have been provided to house at least one pair of every known variety of game birds.

treating food that has not been chewed. When the food is swallowed, it finds lodgment first in the *crop*, a large sack at the bottom of the gullet. Here it is soaked and softened for some time, and is then passed on to the *gizzard*, a kind of stomach, with strong, muscular walls, and tough, wrinkled lining. Here the food is ground fine by vigorous rubbing, aided by small stones which have been swallowed by the bird. The flesh-eating birds have smaller gizzards, with thinner muscular coats, than have the grain-eaters, for the softer food does not need nearly so much grinding as do the hard-skinned seeds and grains; in some species of flesh-eaters, there is no gizzard at all.

Like larger animals which live upon flesh, the carnivorous, or flesh-eating, birds are strong, fierce, and unsociable. They do not live in friendly colonies, as do the cheerful and harmless grain-eaters, but withdraw for the most part into some secluded region of forest or rock. However, some fish-eating birds, like the herons and many sea birds, nest in colonies.

It is seldom that birds, during their waking hours, are to be seen at rest. They are constantly flying about, darting from one place to another, not at random, but with a very definite purpose—to find food. For their active bodies, high temperature, and rapid circulation demand so much food that they must be eating most of the time. To anyone who has watched fledglings being fed, it must have seemed incredible that such tiny bodies could possibly absorb so much nourishment, for it is an actual fact that these little birds regularly eat more than their own weight of food in the course of a day. Most young birds, even those which later prefer seeds and grain, are fed on insect food, and as they appear when insect pests are most numerous, man is usually much benefited by their hearty appetites.

Relation to Man. It is the enormous quantity of food required by birds which makes the various wild species of such value to the farmer. Not many years ago, the farmers were inclined to look upon nearly all birds as pests, because a few of them stole grain or nipped the cherries and blackberries, but to-day there exists a truer appreciation of the part they really play in industrial life. For the insects upon which birds feed so voraciously are in many instances the very worst plant enemies—the enemies which each year cause a loss of hundreds of millions of dollars to the farmers. This loss would be much greater without the services of birds; careful scientists who have observed and collected facts for years say that successful agriculture would probably be impossible without the birds. The seeds, too, which furnish so large a part of the food of many birds, are most frequently weed seeds; it is estimated that the native sparrows alone save to the farmers of the

United States and Canada millions of dollars each year by eating these seeds. There are some birds, it is true, that do help themselves occasionally to the farmer's grain, but there are very few which do not more than pay for such thefts. Even the crow, the owl, and most of the hawks, generally classed as robbers, by their wholesale destruction of



Photo. U. S. I.

STRANGE LOCATION FOR A NEST

A sea hawk, which lives commonly in a tree, sought an unusual though slightly place for its home

insects and small rodents prove themselves friends rather than foes to the farmer.

The safe thing for a farmer to do is to acquaint himself, as far as possible, with the birds of his neighborhood and find out their favorite diet. Then such as do really prey on the crops without making adequate return may be driven away or killed, while the others, far more numerous, may be attracted in every possible way. Protection of such birds from enemies, especially cats; providing them with food at times when it is not otherwise available, and with water for drinking and bathing; and the supplying of artificial nest boxes or other safe places for building, will do much to attract the useful birds to spots where they are needed. Even the village or city dweller, who does not need the help of the birds as does the farmer, may by similar methods bring about his house a colony of birds which will give him continuous pleasure.

Cage Birds. Certain birds have for a long time held a peculiar relation to man in that they have lived in his home and been, in a sense, domesticated. The gracefulness, beauty, and cheerful songs of birds have always made a strong appeal; centuries before the beginning of the Christian Era, the custom of keeping birds in cages was common. To-day, the number of such pets is greater than ever

before; most of them have not been captured and confined to a cage after having known the joys of a free life, but have been bred and raised in captivity. In such a case, the keeping of caged birds cannot be called cruel, as it would be to keep any free, wild thing.

Canaries are by far the best known of all the birds which are kept for their song. Parrots are the favorite talking birds, while parakeets, cockatoos, and certain finches are often kept, on account of their beautiful plumage. It is almost always the grain-eating birds which are trained as cage birds, because it is far easier to feed them and because they are not used to

so active a life as are the insect-eating birds. No person who is not willing to take excellent care of a bird should ever have one, for one of the absolutely necessary things is that the cage and all it contains should be kept strictly clean, and that the bird itself should have opportunity for frequent baths. Some birds like to bathe more than once a day.

Classification. Many systems of classifying birds have been offered, no one of which seems entirely to please scientists. The lists at the end of this article give perhaps as simple a method of grouping as any which is now in use. D.L.

The Study of Birds

In recent years, there has been a growing interest in birds—in their appearance, their habits, their value to man—and many "bird books" have been published to meet the demand for accurate information. Some of these are simple little books which list and describe the birds of a certain locality, so that people there may recognize them on sight, while others are more elaborate publications, with beautifully colored illustrations. More general treatises also abound, which give charming accounts of the manner of life of the birds. But no one, no matter how carefully he has studied such books, can really know birds unless he has studied them first hand, at first in the laboratory or schoolroom, and later in the field. The following lessons on birds are designed to aid the teacher or parent in interesting boys and girls and showing them how to begin the study of the most fascinating of all their wild neighbors.

Lessons on Birds. General Suggestions. 1. Birds in their natural state are so hard to approach that they must be tamed before one can successfully study them. This is accomplished only by feeding them, for, as one writer has said, "The way to a bird's heart is through its crop." Instructions as to feeding and taming birds should be given during the first lessons. Much may be learned by watching birds at their nests.

2. It is exceedingly important that the teacher's knowledge of her subject be much broader than the work actually assigned to the class. She must be familiar with the size and color of the bird and of the quality of its singing note; she must be able to recognize the features that distinguish male and female, and in addition, know the habits and haunts of the bird. What it feeds upon, how its food is obtained, when and where it makes its nest, when the young are hatched, how long they remain in the nest, and the dangers that beset them after they have learned to fly, are some of the facts which the successful teacher will master. The children must be taught how to help the

young birds, for very many of them die from lack of care.

3. The greater part of the work on bird study should be devoted to outdoor exercises.

4. Classroom work should consist chiefly of hearing reports and giving instruction for future observations. On completing the study of a bird, assign the review of the work for a class exercise. Finally, the review should be written; this affords an opportunity for drill in composition.

Suggestions for Observations. 1. The return of the birds in the spring is a subject that never fails to interest children. Have them report the first birds they see; have them keep a record of these reports in some such form as this:

The first crow, March 1.

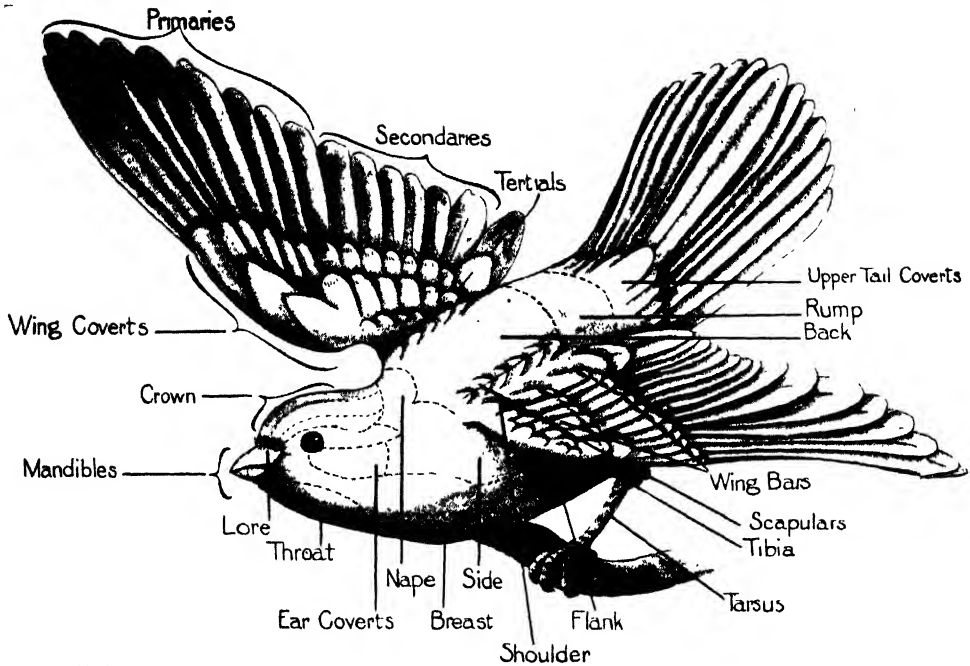
The first robin, March 10.

Besides a general school record, there should be separate records, kept by the pupils individually. Instructions for observing the birds should be complete and clear. Observations are most successfully made by one pupil alone, or by groups of not more than two or three, as birds are easily frightened by noises and by the approach of people, whom they are likely to regard as enemies. The directions should include these points:

(a) In making trips to study birds, wear dull-colored clothing, preferably shades of brown, which tone in with the ground and trunks of trees. White and bright colors are not practicable, because they attract attention.

(b) Move gently and quietly, so as not to frighten the birds. As a rule, the observer can approach them more successfully if he pretends to be searching for something else. He should not walk directly toward a bird, but should gradually approach more closely by walking around it in a spiral, if possible, with the sun behind the observer. It is not possible to distinguish the colors of a bird clearly if it is seen with the sky as a background.

2. Train the pupils to describe only what they actually see, and insist on their making careful observations. Caution them about



PARTS OF A BIRD

imagining that they see the thing they are looking for.

3. An opera glass will be found very convenient, but it is not so valuable as a few good books. Such works as Chapman and Reed's *Bird Guide*, or Chapman's *Handbook of the Birds of Eastern North America*, or Bailey's *Handbook of Birds of the Western United States*, should be found in every school library, and be used on observational trips.

4. Each pupil should carry a pocket notebook in which to jot down observations as they are made. If the memory alone is relied upon, valuable points may be omitted.

Parts of a Bird. The parts of a bird, with names attached, are shown in the diagram on this page. All but the very young pupils should learn these terms, as they occur in all books about birds. Little children should learn to recognize the most prominent parts, as the head, wings, tail, etc.

1. For a practical exercise, have the children compare a live bird, a mounted specimen, or the skin of the bird, with the diagram, and ask them to name the corresponding parts. The first lessons should be the easier ones, the naming of the head, mandibles, wings, legs, and tail. Have the pupils measure the specimen from the point of the beak to the end of the tail.

How many inches long is it?

Spread out the wings, measuring them from tip to tip. What is the distance?

Compare this distance with the length.

2. To make sure that the pupils remember what they have observed, begin the second lesson by reviewing the first. Then proceed to the study of the smaller parts, taking up this part of the work systematically, as follows: first, study the parts of the body, the head, nape, breast, beak, and rump. When these parts have been learned, study in like manner the wings, tail, and legs. Classes above the fifth grade should have no difficulty in distinguishing and naming all these parts. An occasional exercise on them in connection with the other lessons will help to fix them in the memory.

3. The way in which the structure of a bird is adapted to its mode of life is a topic of absorbing interest. The older classes should be led to see that a bird of prey has a different beak from one which feeds on fruit and insects, and that their feet also are not similar. Variations in the structure of different birds are illustrated in the diagrams on page 758.

Local Protection of Birds. The lessons on bird protection are designed to increase the interest of children in birds and their love for them, and to impress upon them how valuable the birds are to the farmer and gardener. They should be encouraged to give their services in protecting the birds and in making it easy for their feathered friends to return to the same nesting places year after year. There are several ways in which this can be done. To illustrate:



RUBY-THROATED HUMMING BIRD
GOLDFINCH

Courtesy Royal Ontario Museum of Zoology
BALTIMORE ORIOLE
CHICKADEE

peckers, are very fond of suet, which may be placed in the bark of trees or may be tied in a net in such a way that they cannot carry it off, but have to eat it as they need it. No iron nails or metal wires should be used in fastening suet or meat bones intended for these birds, for when the weather is very cold, the tongues or eyes of birds will adhere to the frozen metal, and the birds will be seriously injured. Crushed peanuts and crushed nuts of all kinds are very acceptable to many birds; jays will greedily take peanuts in the shell.

It is much more difficult to do anything for the insect-eating migratory birds, such as robins, thrushes, and warblers, when they are overtaken on their migrations by unexpected cold weather. If one has a garden, he can readily attract them by clearing away the snow, if there is snow on the ground, and digging up a piece of ground. They will then readily come and search for worms and any insects and larvae that may be turned up. Softened white bread, oatmeal, and other breakfast foods, boiled potatoes, and hard-boiled eggs chopped fine have also been known to be accepted by birds under stress of weather; if the birds get used to it, nearly all the common song birds will eat moistened wheat bread freely, even in the middle of the summer, if there happens to be a time when their natural food is not abundant.

Water for Birds. During dry periods in summer, birds are often in need of water. Shallow pans from one to two inches deep are readily used both for drinking and bathing, but the pans or dishes should be so placed that the birds are free from the attacks of cats, and the water should be frequently changed. There is, perhaps, no device that will attract so many birds and enable one to observe them so intimately as a suitably built bird bath in a park or suburban lot. On bright days there is likely to be a steady stream of bird visitors to the spot.

Planting Shrubs and Trees for Birds. Many wild and native shrubs and trees offer special attractions for birds. Among the trees may be mentioned mountain ash, hackberry, and black cherry; among shrubs, the red-berried elder, the black-berried elder, chokecherry, pincherry, honeysuckle, and Juneberry will attract many species of birds. The red-berried elder furnishes the first wild fruit in early summer for young and old birds, while the black-berried elder is much sought by thrashers, catbirds, and others early in the fall, just before they start on their southward migration. Anyone especially interested in this subject should write the United States Department of Agriculture, Washington, D. C., for the Farmers' Bulletin, "How to Attract Birds."

D.L.

A Home for Birds and a Decoration for the Garden

Mr. and Mrs. Wren were house-hunting. They had recently returned from a long southern trip, and they found it necessary to look up new quarters, for the home they had occupied during the preceding season was sadly out of repair. The roof leaked, the inside of the house was very dirty, and the premises generally looked as though the caretaker had neglected his duty.

"Well, I suppose we'll have to build a new one," said Mr. Wren, heaving a sigh. "I confess that I had hoped to make the old house do for another season, but this seems pretty hopeless."

"I was much attracted by those new houses on Garden Terrace," said Mrs. Wren. "Let's take another look at them before we start to build. They certainly are different from the style of house that we have lived in so long, and I for one would be glad of a change."

"Do you mean those fancy cottages with bright-colored roofs?" said Mr. Wren, doubtfully. "They did look rather well on the posts of the garden fence, but I never supposed they were intended for modest people like ourselves. I thought they were built for aristocrats!"

"Nonsense!" said Mrs. Wren. "Those are the houses that were advertised in the papers, as being especially adapted for the homes of

wrens, bluebirds, chickadees, and all kinds of middle-class birds. Why shouldn't we have a beautiful house, if we can find one that is within our means, and at the same time is practical? Come along!"

Mr. Wren knew from experience that it was useless to argue with his wife, when her mind was thoroughly made up; so he flew meekly after her, across the fields and over the streets, until they came to a beautiful garden. The fence was quite high, and every post held a tiny wooden house, gaily painted in bright colors. One house with white and green decorations and an orange-colored roof seemed to please Mrs. Wren particularly. It was not too large, its entrance was of the right size, and there was a neat and stylish porch. It was the prettiest house in Garden Terrace. The Wrens decided to take it.

Building Bird Houses. Every friend of the birds will appreciate the "moral" back of this little story. There is no better way to encourage the pretty songsters to make the yards and gardens their permanent abiding places than to build attractive homes for them. Some birds will return season after season to the same nesting place after they learn that comfort and shelter can be enjoyed there. Children should be urged to build

HOMES *for* BIRD FRIENDS



homes for the little summer visitors, for in this way they help to protect the birds as well as to make the premises about the house delightful throughout the season. Below are given directions for building a type of bird house that the children will enjoy working upon. The two pages of drawings and the page of colored pictures accompanying this article show various kinds of bird homes that can be constructed by any children who are familiar with simple tools.

The children who built the house occupied by the Wrens used $\frac{3}{4}$ " stock of whitewood, and it and the other houses on the Terrace were made so that they could be nailed against a barn, a post, or a tree (see illustration, *Homes for Bird Friends*). The roof provides a protective overhang. Six pieces of wood, in shapes and sizes shown in Fig. 1, on page 762, were used in making the house selected by the Wrens. These pieces were nailed together with $\frac{1}{4}$ " brads, making what are known as butt joints, as shown in the working drawing (Fig. 2). The top edge of the front piece and the two end edges of the roof were carefully beveled, in order to secure the proper slant of the roof.

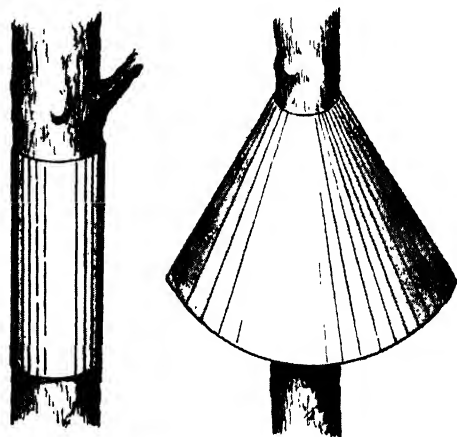
To protect the house from the weather, and also to make it an attractive feature of the garden, two coats of outside paint were applied when the house was built. The four sides and the bottom were painted white. The roof received two coats of orange coach paint. On the sides of the house were painted simple tree shapes, in green. The shapes of these decorations were first cut from paper, as shown in Fig. 3. The unit developed in this way was placed three times on the sides, and twice on the front of the house. The shapes were traced with a pencil on the white paint, as shown in Fig. 4. The tree shapes were then carefully filled in with green paint, and the trunks and bases with orange paint.

Fig. 5 shows two completed wren houses, with the color schemes indicated.

The material on bird houses thus far given, and the illustrations referred to, are especially applicable to such birds as wrens and martins, who are not very particular as to the kind of houses they occupy. The habit of using nesting boxes by American birds is not yet so well established as is true among the birds of Europe. On the estate of Baron von Berlepsch in Germany, 2,000 nesting boxes were supplied and ninety per cent of them were occupied. Although American birds do not yet use nesting boxes so freely, as many as forty-five different species of rather diverse habits are known to have used bird boxes or shelves provided for them, including birds of such wide range of habits as bluebirds, robins, chickadees, tufted titmouse, nuthatches, brown creepers, wrens, swallows, phoebes, flickers,

woodpeckers, owls, sparrow hawks, mourning doves, and wood ducks. The average number of birds over the Eastern United States is about one pair to the acre, but by the use of nesting boxes and other attractions, the number in suburban districts and in parks may be increased to about ten pairs to the acre.

The best and most available material for bird boxes is wood, and the different kinds of soft woods are preferable to hard woods. Metal is not desirable, because it is a great conductor of heat. Rough slabs with the bark retained, which may often be obtained at saw mills, are very desirable material, but it is not desirable to nail bark to the boards. It is likely to come off, and insects are quite sure to find hiding places between the wood and the bark. Birds probably prefer nesting houses



FOR PROTECTION OF BIRDS

Metal forms, usually of tin, placed on trees to prevent bird enemies from reaching the nests and the young birds.

built of lumber with the bark on, or rough-sawed and weathered boards, but whenever desirable, the houses may be painted neutral tones of brown, gray, or dull green. Martin houses and wren houses that are placed where the sun shines on them may be painted white.

All bird houses should be substantially built, and the roofs should be so constructed that they will shed the rain.

As far as possible, bird houses should be so placed that they will be shaded during the warmer part of the day. They are best placed on wooden or iron poles or pipes, or on lone trees not readily accessible to cats and squirrels. It is very desirable to protect the post or tree by a strip of tin, as shown in the illustration.

All bird houses should be so built that they can easily be cleaned, and they should be cleaned of all rubbish every year after the

HOMES for BIRD FRIENDS

How to make a Bird House

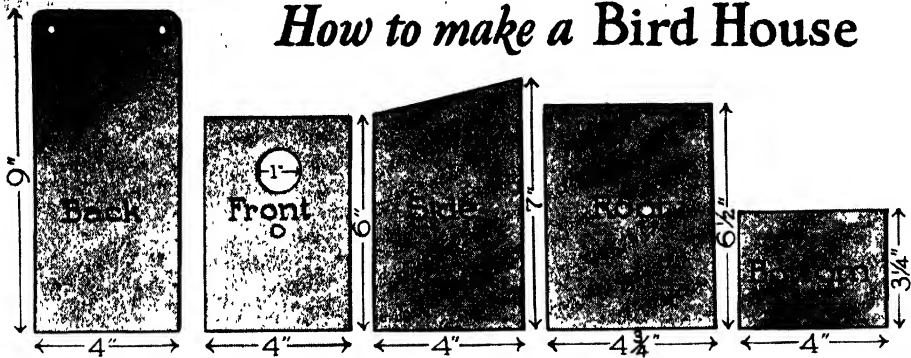


Fig. 1 - Six Pieces of $\frac{3}{8}$ " White Wood

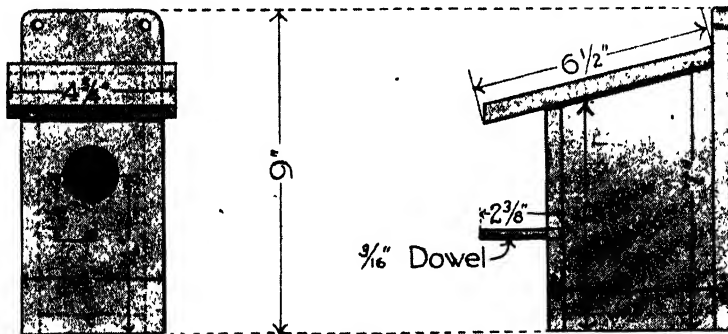


Fig. 2 - Working Drawings of Bird House

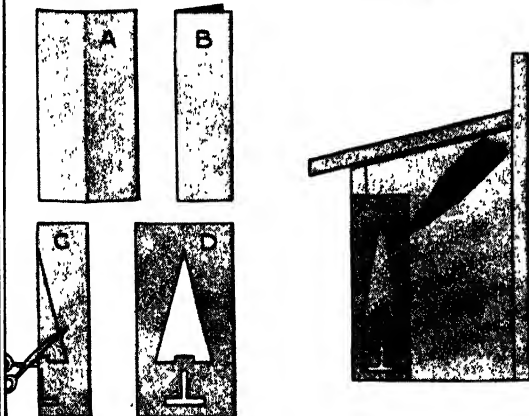


Fig. 3 - Manila Paper Folded Lengthwise. Half of Pattern Sketched on Fold. C: Process of Cutting. D: Pattern Completed.

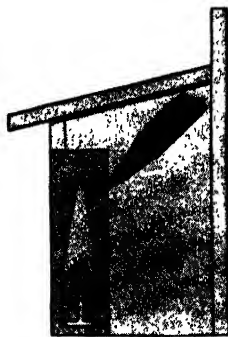
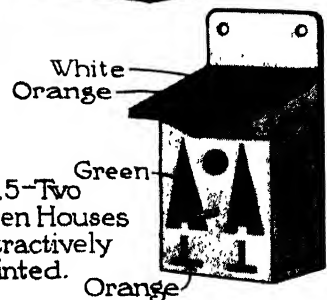


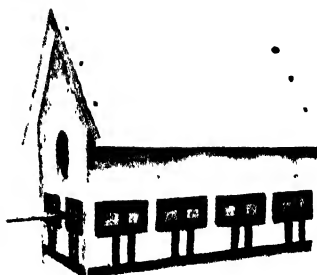
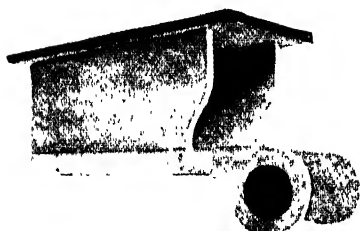
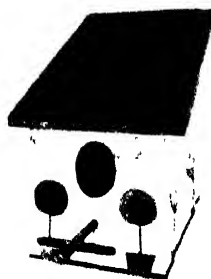
Fig. 4 - Shows Process of Tracing Design on the Side of House



Fig. 5 - Two Wren Houses Attractively Painted.



For OUR BIRD
NEIGHBORS



KATE ABLEMAN

birds are through with them. It is often desirable to place some chips or earth in the bottom of the houses. This prevents the evaporation of too much moisture from the eggs. It is not necessary to place bird houses very high. If they are placed so as to be within easy reach from a stepladder or a chair, they can be readily cleaned and examined, and means can be taken to keep out the house sparrows, which are an annoyance to most birds which are likely to nest in boxes. D.L.

Nests of the Birds

Of all the wonderful things which one may discover about his favorite birds, there is nothing more wonderful than their nest-building power. How can young birds in their very first spring know how to set about building a nest exactly like the one out of which they were forced, as awkward fledglings, in the summer before? The parent birds are not near to instruct them, and yet the nests are in practically all instances as perfect as were those built by their parents or their grandparents. This curious nest-building instinct cannot be explained; it must ever remain a mystery.

Purpose of Nests. In one sense, a nest is not a home. Two robins building their first nest do not pick out the spot that suits them best and fashion a structure which will afford them most comfort, but they build with one purpose in mind—to provide a place in which eggs may be laid and brooded until they hatch, and in which the young may be protected until they are able to fly. The nest is in a sense the little birds' nursery, in which they live and are happy until they are ready to start out into the world; but very, very few of them ever come near the nest again once they have learned to fly, and even the parent birds abandon it when it has served its one purpose. But for that one purpose it is remarkably well adapted, and each bird builds just the type of nest which fits its own need.

Variations in Nests. In nothing do the various birds differ more widely than in the kinds of nests they build, and it is very interesting to observe the growing perfection of the nests as the birds rise higher and higher in development. In part, this is because the higher orders of birds are more intelligent, but largely it is because the young of these higher forms are more helpless. The "chicks" of the domestic fowl, of the ostrich, and of various other birds have a full covering of down when they are hatched, and are very soon able to run about and seek food for themselves, but the young of the birds of flight, and especially of the song birds, are utterly helpless and require the protection of a carefully built nest and the watchful care of the parents. So an ostrich merely makes a hole in the warm sand

and there deposits its large thick-shelled eggs, while an oriole, on the other hand, fashions a most curious and wonderful structure, in which its eggs and its helpless young are comparatively safe from reptiles and other preying animals. In general, the nests of the smaller birds are the more beautiful.

Nests of Special Interest. The different varieties of nests are too numerous even for listing. There are burrowed nests, ground nests, carpenter nests, basket nests, mud nests, woven nests, and ever so many more; but a few of the more interesting kinds may be described here. Hunting and studying birds' nests is a fascinating pursuit, but it should not be indulged in while the nests are still in use. The bird-lover may discover the whereabouts of the nests of various birds, and later, when the young have flown, may examine them at his leisure; but it is not safe to bring nests into the house until they have been carefully disinfected, as they are likely to be swarming with vermin.

Beginning at the very bottom, there is the king penguin, which simply deposits its eggs on the bare rock and pays little further attention to them. Then there are the burrowing birds, such as the sand martin and the kingfisher, which dig deep tunnels into a bank, usually facing the water, and lay their eggs at the far end; and the ground-nesters, as the turkey or the goose, which scrape together on the ground shelters of leaves and grass. Very curious is the habit of the tropic mound birds, which build up great heaps of vegetable matter, lay their eggs therein and trust to the heat of the decaying pile to hatch them. Somewhat higher in the scale are the mud or clay nests, made by some of the commonest American birds. The swallows' nests are entirely of clay, and are of varying shapes, some looking much like gourds, with their bent necks, in the end of which is the "door"; but the robin uses mud merely as a cement to hold together a nest of twigs and leaves, which it lines with cotton, wool, or hair, or any other soft substance it can find.

Then there are the carpenter nests, which are in reality but holes in stumps or trees, with a very little soft material laid down for a bed. Of the birds with such wooden nests, the commonest examples are the woodpeckers, which for the most part choose dead trees, though the ivory-billed and pileated species can cut their nests into living hardwood trees. A number of song birds make their nests on the ground, blending them in with the surrounding vegetation so cleverly that only the practiced eye can find them; but by far the larger number choose shrubs or trees, and the majority of them build what are known as basket nests—loosely woven structures of twigs, stems, grass, or any other material that may be near at hand.

Not all of these are equally well made; the crows and eagles, for example, construct very rough, coarse nests, while the thrushes and the warblers are very neat and skilful.

Probably the most beautiful and interesting of the comparatively common bird homes are the woven nests of the humming birds, the orioles, and a few other species. To do their best work, these birds must live near dwellings, where they can get wool or hair or twine; and their eyes are very sharp in spying any bit which may have been left about for them. The humming bird's nest is so closely and smoothly woven that it looks like felt, and so tiny that it may swing from the top of a branch, almost hidden from the eyes of the curious by the greenish lichens with which its

little makers have adorned it; the oriole's nest, larger but no less exquisite in structure, usually hangs as a pouch from the tip of a long, drooping elm branch (see BALTIMORE ORIOLE, for illustration).

A few birds, as the cowbird and the European cuckoo, for reasons difficult to explain, do not build nests for themselves, but lay their eggs in the nests of other birds; but for the most part, no trouble is too great for the parent birds to take to secure suitable housing of their eggs and young, and the heroism which they show in defending their nests from enemies far larger and stronger than themselves entitles them to rank among the bravest of all the animals, whether they are large or whether they are small. D.L.

Migration of Birds

This is one of the great marvels of nature—the advance and retreat of an army of birds, so great that one might imagine the sky at times would be dark with them. However, few people ever see them in their flight. Astronomers, viewing the full moon through their large telescopes in August and September, frequently see the small migrating birds, high in air, cross their field of vision, and are often able to distinguish the finches, thrushes, and others. The Canada geese, in their honking, orderly ranks, are a familiar enough sight in the fall to those who live in Central North America, and hunters can predict very closely when the “duck season” will begin. But why does no one ever see bobolinks and the plovers, the swallows, the sparrows, and the warblers sweeping over the hills and valleys and over the roofs of the cities? One day there are no martins to be seen, no warblers to be heard; the next day they seem to be everywhere, making themselves as much at home as though they were permanent residents and not mere summer tourists settling for a brief sojourn. How far have they flown? Where have they spent the winter? How long did it take them to come back? Why do they migrate? These questions and many more are certain to occur to any student of this most fascinating subject.

Why Birds Migrate. The little sparrows that hop about in the deepest snow of winter and seem to enjoy themselves prove clearly that some birds are not affected by the cold; careful study has made it practically conclusive that this is true of all birds. A mocking bird, which everyone is accustomed to think of as a dweller in warm climates, was observed to live happily in New York during an unusually cold winter. Frequently bluebirds, looked upon as the surest harbingers of spring, will winter in a northern wood. The condition of residence depends on the food supply. The

vagrant mocking bird has found a privet tree; the bluebirds hover near a berry-covered cedar tree. But those birds which feed upon insects or worms would starve if they could not seek their winter food in less severe climates than the temperate zones. There is thus a rough division of birds into those which make long migrations and those which do not, strictly according to the demands of their appetites.

But the need for food cannot alone account for the marvelous departure of the birds from their summer homes. If it did, insect-eating birds would remain the year round in the warm parts of the earth, where the air is full of their prey. Moreover, some of the birds start south in August, when insect life is still plentiful in the higher latitudes. Behind the great movements there is some primal cause, some strong urge which man cannot comprehend. Scientists explain that ages ago, when climatic conditions were much more extreme, birds were actually forced to migrate by the slowly advancing ice cap which came down from the Pole, crowding out vegetable and animal life before it. As this receded, the birds began to press northward from their enforced home, and somehow this planted in them an instinct, an heredity of habit, which resulted in the seasonal migrations. However that may be, it is certain that, as spring approaches, something says to certain birds. “Fly northward, and there build your nests and rear your young”; and in a few days the northern woods and fields begin to swarm with welcome visitors. Bird-lovers who find the domestic life of the pretty creatures that nest in their yards a source of unceasing interest report that pairs of birds sometimes return season after season to the same tree or bird house.

How They Migrate. When they have felt the “mysterious call,” the birds respond at once, each species organizing its flight as have

BIRDS' NESTS



Mourning Dove



Barn Swallow



Ovenbird



Baltimore Oriole



Robin



Bush-tit



Red-Eyed Vireo



Hummingbird



Goldfinch

Carl F. Gronemann.

its ancestors from time immemorial. Some species are most systematic; others are more happy-go-lucky, traveling as the spirit moves, and covering no great distance at a time. Almost invariably, however, there is a certain order. The old males, strong of wing, fly first; next come the females; at the close of the procession are the young birds, who are re-visiting their northern birthplace for the first time. Perhaps, as they advance northward, they may find that they have started a little too soon. Then they slacken their pace, and tarry in the intermediate regions for a time. Some kinds of birds fly openly day by day, but many of the ordinary night-flyers and the more timid species migrate only by night, sheltering themselves in secluded places during the day.

There is a difference observable in the spring and fall flights. In the former, the birds are fresh and strong from their long winter's feeding without family cares, and the trip may be made easily. The males don their brilliant courting dress, and their arrival at any given place is a conspicuous event. In the fall, however, the birds move more slowly. They have worked hard during the summer feeding their young, for this is a tremendous task, and have as yet scarcely recovered from their molting season, and there are, besides, the young birds which have not yet tried their wings in any very long flight. Stop-overs are frequent, and sometimes the whole flock taries in a rich feeding ground for weeks, gathering strength for continuation of the long journey. The bobolink, for instance, stays for a time in the Carolina rice fields. The mating instinct does not urge them onward, for they build no nests and raise no young in their winter homes in Central and South America.

Migration Routes. Some of the birds make what would be a very long journey, even for larger travelers. The golden plover, one of the most ambitious birds, breeds far north, on the shores of the Arctic Ocean; with the approach of fall it moves into Nova Scotia, and from there lays a direct course southward to the north coast of South America, flying for hundreds of miles across the open Atlantic, far out of sight of the shore (see diagram herewith). The yellowlegs and Arctic terns are the world's most famous travelers; the latter summer as far north as the Arctic Circle, and take an 11,000-mile flight to the Antarctic Circle every autumn, returning in the spring. Twenty-two thousand miles a year on a serious adventure, borne onward by one slender pair of wings! Other birds there are, too, which cross great stretches of trackless water, and the mind of man cannot even conjecture what guides them. Observation has been extensive enough to show that there are a number of well-marked migration routes along which most of the birds travel—in America no fewer than

seven "trunk lines." In part, these are determined by the land-surface features, and in part by the presence along the way of food supplies, but nothing has as yet been discovered



PRINCIPAL ROUTES OF MIGRATIONS,
SHOWING EXTENT OF FLIGHT

which will account in the least for the route of the "ocean-going" birds. The valleys of the great rivers running from north to south are favorite highways of the migrating birds.

Longfellow thus describes the mystery of bird migration:

I hear the beat
Of their pinions fleet,
As from the land of snow and sleet
They seek a southern lea.
I hear the cry
Of their voices high
Falling dreamily through the sky,
But their forms I cannot see.

Bird Banding. The United States Biological Survey is making an extensive study of the migration and geographical distribution of birds by the use of identification bands. These bands are made of metal, and are attached to the legs of trapped or nesting birds released for flight. Each band bears a serial number and the address to which the captor of the bird should send a report. By this means, the Biological Survey is collecting valuable data which it is hoped will answer many puzzling questions regarding bird migration. The bureau also makes records of the longevity of birds. Five or six years is a fairly good age for most of the common species, but there is record of a pintail duck that lived to be thirteen years old.

D.L.

Government Protection of Birds

Bird Reservations. Tracts of land or water— islands and marshy places along rivers and shores, wild stretches in mountainous districts and lakes—which are set apart by national, state, or provincial governments as permanent and safe retreats for the native wild birds, are known as *bird reservations*. There they rest in permanent peace and security from the hunter. Without such protective places, many species of birds would before many years become extinct.

The first United States reservation was established by President Roosevelt in March, 1903, when, by special proclamation, he set aside Pelican Island, in Indian River, Fla., as a home for the pelicans that nested there. In 1909, when he retired from office, he had established fifty-three different bird reservations. This great work was continued by his successors. There are now nearly seventy bird reservations.

These places of refuge are located in all parts of the national domain, from Porto Rico, on the south and east, to the chain of Aleutian Islands, off the coast of Alaska; along the Gulf and Atlantic states; midland in Nebraska and South Dakota; along the Mississippi in Minnesota, Wisconsin, and Iowa; and westward in Oregon and California; while in the Pacific is the great Hawaiian Island Reservation. In addition, thirty or more reservations are maintained under the supervision of the National Association of Audubon Societies.

In 1929 an act was passed by Congress which provides for a national system of sanctuaries where migratory and other birds may feed, rest, and breed, unmolested, in marshy and woodland areas. In every state and in Alaska, one or more such sanctuaries will be created. Edward W. Bok established a bird sanctuary and singing tower on a tract of fifty acres at Mountain Lake, Fla., in 1929.

Game Laws. The wanton and careless destruction of wild birds by sportsmen and

plumage-hunters, which in the past has diminished the birds at a deplorable rate, has awakened the people to the need of protective legislation. The loss to farmers from preying insects would be much greater than it is but for the birds, and it would be a calamity not to preserve for mankind the many beautiful

and sweet-singing creatures of the woodland so greatly in danger of becoming extinct. The most far-reaching law in force in the United States, the McLean Act of 1913, officially known as the Migratory Bird Law, gives the Federal government control of all migratory birds and game birds which do not remain permanently within the limits of one state. The Department of Agriculture is empowered to prescribe regulations in regard to closed seasons, zones, and similar matters. In 1916 the United States and Canada ratified a treaty pro-

viding for the protection of all beneficial insect-eating birds, and otherwise restricting the hunting of game and non-game birds. In 1918 Congress passed a law putting the treaty into effect.

The various states have also passed protective laws. There are special laws in force pertaining to the hunting of birds in nearly all of the Canadian provinces, and in 1915 a law prohibiting the importation of wild bird skins for commercial purposes went into effect over the entire Dominion. The importation of skins or feathers of birds into the United States is now illegal.

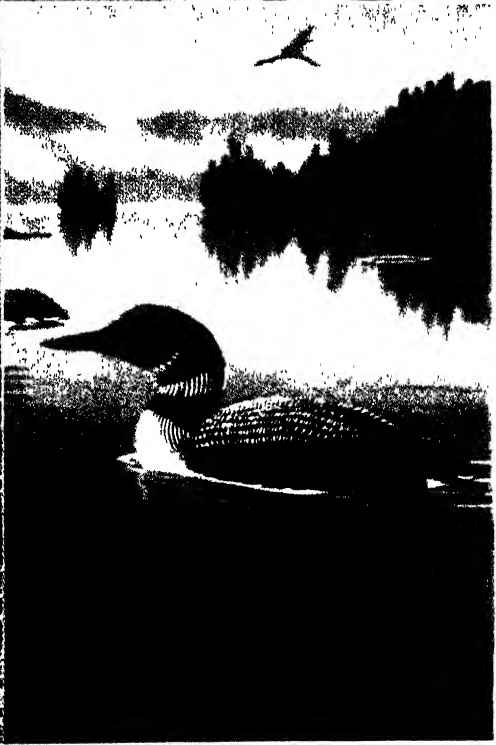
Bird Day is a special day observed by the school children of the United States and Canada. It was set apart to teach them the importance of protecting the birds, "the winged wardens of the farms." Not only are they taught that the birds save the farmers of the country millions of dollars each year by their destruction of harmful insects, but they learn the equally important lesson expressed so



Photo U & U

NOT AFRAID OF MEN

A photographer had no difficulty in making a friendly approach to thousands of gannets on a government-protected home on the west coast of Africa



Courtesy: Royal Ontario Museum of Zoology

BLUEBIRDS
RUFFED GROUSE

SCARLET TINNAGERS
LOON



BIRD DAY

A SUGGESTIVE PROGRAM

Do you ne'er think what wondrous beings these?
Do you ne'er think who made them, and who taught
The dialect they speak, where melodies
Alone are the interpreters of thought?

—LONGFELLOW.

Song, *The Skylark* James Hogg
Roll Call, answered with names of birds
Who Stole the Bird's Nest Lydia M. Child
(By a Group of Pupils)

Essay, *The Meaning of Bird Day*
The Building of a Nest Margaret Sangster
To a Water-Fowl William Cullen Bryant
The Bluebird Eben E. Rexford

Quotations about Birds

The Sandpiper Celia Thaxter
Remorse Sydney Dacre

Essay, *Birds' Eggs I Can Recognize*

Song, *The Birds' Ball*

The Whitchroat Theodore H. Rand
In April Emily G. Arnold

Essay, *How Birds Help the Farmers*

Robert of Lincoln William Cullen Bryant
What Robin Told George Cooper

Robin's Return Edith Thomas

A Dialogue between Mr. and Mrs. Wren

Song, *The Brown Thrush* Lucy Larcom
Birds in Summer Mary Howitt

OUTLINE AND QUESTIONS ON BIRDS

Outline

I. Important Characteristics

- (1) A covering of feathers
- (2) Power of flight
- (3) Possession of a backbone and warm blood
- (4) All have two legs
- (5) Eyesight

II. Framework of the Body

- (1) Hollow bones
- (2) Air cavities
- (3) Keel-like breastbone

III. How the Birds Fly

- (1) Wings
 - (a) Modifications of forelimbs
 - (b) Uses of the feathers
- (2) Tail
 - (a) The bird's rudder
- (3) Long-distance flights
- (4) Rapidity of flight
- (5) Examples for airship-builders

IV. The Coat of Feathers

- (1) Where the feathers grow
- (2) Why they vary for different birds
- (3) Purpose of oil glands
- (4) Why the male is brightly dressed
- (5) Colors of female
- (6) Molting

V. Senses

- (1) Sight
 - (a) Compared with that of other animals
 - (b) Sensitiveness to light
- (2) Hearing
 - (a) How birds hear
 - (b) Acuteness of this sense
- (3) Touch, taste, and smell
- (4) Sense of direction
 - (a) The carrier pigeon
 - (b) Birds that return to last-year's nests

VI. The Song of Birds

- (1) Their "organ of speech"
- (2) Birds most gifted in song
- (3) Birds which cannot sing

VII. Their Home Life

- (1) The mating instinct
- (2) Hatching of eggs
- (3) Care of the young
 - (a) Feeding
 - (b) How they learn to fly
 - (c) The part taken by males

VIII. Food

- (1) Animal and vegetable food
- (2) How birds eat
- (3) Methods of finding food

IX. Birds and Mankind

- (1) Value to farmer
- (2) Protection of birds
- (3) Birds as pets

X. Classification

See lists, fully classified, under the heading
Related Subjects

XI. Bird Houses

- (1) Kinds of birds using houses
- (2) Materials and form
- (3) Where placed
- (4) Cleanliness of
- (5) Colors

XII. Feeding Birds

- (1) Why necessary
- (2) Two classes of food
- (3) Methods of serving food
- (4) Need for water
- (5) Bird baths

XIII. Nests of Birds

- (1) Purposes of nests
- (2) How nests vary
- (3) Nests of special interest
 - (a) Burrowed nests
 - (b) Mounds
 - (c) Nests of clay
 - (d) Carpenter nests
 - (e) Wooden nests
 - (f) Woven nests
- (4) Birds that steal nests
 - (a) Kinds

XIV. Migration of Birds

- (1) Why birds migrate
- (2) How they migrate
- (3) The routes they follow

XV. Bird Reservations

- (1) Their purpose
- (2) Location of important reserves

XVI. Bird Day

- (1) What it means
- (2) Its influence
- (3) How observed

OUTLINE AND QUESTIONS ON BIRDS—Continued

Questions

How does the manner in which feathers grow on a bird differ from the manner in which hair grows on a dog, for instance?

What difference is there between the manner in which a bird produces its song and the manner in which a human being speaks?

What is the average number of birds per acre in the Eastern United States?

Why is wood the best material for bird houses?

What are the chief enemies of the birds?

Why is it sometimes necessary to feed birds in winter?

What are the things which birds best like to eat?

How much can a bird eat in a day?

Why do birds need to be eating almost constantly?

How are birds related to snakes?

What resemblance is there between a flying bird and a boat? An airplane?

What is the origin of the old saying, "Like water from a duck's back"?

Why does the bobolink wear different plumage for different seasons?

What instinct brings the carrier pigeon back home even when it has been sent away by train?

How fast do birds fly?

Do birds talk to one another?

Are the same number of eggs laid at each sitting?

How do the newly hatched birds of the lower orders differ from those of the higher orders?

How do baby birds learn to fly?

Why can birds digest their food without chewing it?

In what respect are the birds an aid to agriculture?

What services does mankind owe the birds?

How ancient is the custom of keeping birds in cages?

What are the principal classes into which birds are divided?

Why do some birds build elaborate nests, and others such crude ones?

What birds dig tunnels for nesting places?

How are the eggs of the mound bird hatched?

What sort of cement does the robin use to hold its nest together?

What bird travels 22,000 miles a year?

What are the chief reasons for the periodical flights of birds?

Do the birds travel at the same rate in the spring and fall flights?

What determines the "trunk lines" followed by migrating birds?

Why do governments set apart reservations for birds?

When birds molt do their feathers drop off all at once?

Do they shed all of their feathers?

What proof is there that the sense of hearing in birds is acute?

Why do birds eat during most of their waking hours?

How can wild birds be tamed?

What sort of clothing should one wear on a bird-study excursion?

If you should find a bird with a broken wing what ought you to do?

What bird never builds a nest of its own?

Do mated birds remain together season after season?

Are birds the only creatures that fly? Do all birds fly?

Where do their largest and strongest feathers grow?

Do birds return to their last-year's nests?

How many miles can a carrier pigeon fly in an hour?

beautifully by Coleridge in his *Rime of the Ancient Mariner*:

He prayeth best who loveth best
All things both great and small;
For the dear God who loveth us,
He made and loveth all.

Bird Day was first celebrated in the public schools of Oil City, Pa., in May, 1804, its founder being C. A. Babcock, superintendent of the city schools. Two years later, the United States Department of Agriculture issued a circular urging all public schools to devote a special day to the cause of bird protection. The observance of the day is left to local schools, and the movement is growing each year. The exercises are similar to those used in the celebration of Arbor Day (which see), and the two programs are frequently combined. Bird Day in Louisiana is observed on May 5, the birthday of that great friend of the birds, John James Audubon. D.L.

Related Subjects. The following classified lists will show how fully birds are treated in these volumes

BIRDS OF PREY

Buzzard	Kite
Condor	Lammergeier
Eagle	Marsh Hawk
Falcon	Owl
Goshawk	Secretary Bird
Harpy	Sparrow Hawk
Hawk	Turkey Buzzard
Kestrel	Vulture

FOWL-LIKE AND GAME BIRDS

Curassow	Peacock
Francolin	Pheasant
Grouse	Prairie Chicken
Guan	Ptarmigan
Guinea Fowl	Quail
Jungle Fowl	Tragopan
Mound Bird	Turkey
Partridge	

LONG-WINGED LAND BIRDS

Goatsucker	Swift
Humming Bird	Whip-poor-will
Nighthawk	

PARROTS AND ALLIES

Cockatoo	Parrakeet
Lory	Parrot
Macaw	

PERCHERS

American Goldfinch	Crossbill
Baltimore Oriole	Crow
Bellbird	Crow Blackbird
Birds of Paradise	Dickcissel
Blackbird	Finch
Bluebird	Flycatcher
Bobolink	Grackle
Bower Bird	Grosbeak
Brown Thrasher	Indigo Bird
Bullfinch	Jackdaw
Bunting	Jay
Canary	Junco
Cardinal Bird	Kingbird
Catbird	Kinglet
Chaffinch	Lark
Chat	Linnet
Cock of the Rock	Lyre Bird
Cowbird	Magpie
Creepier	Martin

Meadow Lark	Starling
Mocking Bird	Stonechat
Nightingale	Sunbird
Nutcracker	Swallow
Nuthatch	Tailor Bird
Oriole	Tanager
Ortolan	Thrush
Oven Bird	Titmouse
Phoebe	Umbrella Bird
Pipit	Vireo
Raven	Wagtail
Redbird	Warblers
Redstart	Waxwing
Robin	Weaver Bird
Rook	Wood Pewee
Shrike	Wren
Snow Bunting	Yellow-Hammer
Sparrow	

PIGEONS

Carrier Pigeon	Passenger Pigeon
Dodo	Pigeon
Dove	Turtledove

RUNNERS FLIGHTLESS BIRDS

Apteryx	Ostrich
Cassowary	Rhea
Emu	

WATER, SHORE, AND MARSH BIRDS

Adjutant	Jacana
Albatross	Killdeer
Auk	Kingfisher
Avocet	Kittiwake
Bittern	Lapwing
Booby	Marabou
Brant Goose	Merganser
Canada Goose	Night Heron
Canvasback	Oyster Catcher
Coot	Pelican
Cormorant	Penguin
Crane	Petrel
Curlew	Plover
Darter	Puffin
Dipper	Rail
Diver	Ruff
Duck	Sanderling
Egret	Sandpiper
Eider Duck	Scissorbill
Fish Hawk	Shoveler
Flamingo	Skua
Frigate Bird	Snipe
Fulmar	Spoonbill
Gadwall	Stilt
Gallinule	Stork
Gannet	Swan
Goose	Terns
Grebe	Tropic Bird
Guillemot	Turnstone
Gulls	Widgeon
Heron	Woodcock
Ibis	Yellowlegs
Jabiru	

WOODPECKERS

Flicker	Woodpecker
Sapsucker	Wryneck

UNCLASSIFIED

Cuckoo	Quetzal
Hoopoe	Road Runner
Hornbill	Toucan
Motmot	Trogon

BIRD BANDING. See BIRD (Migration of Birds).

BIRD DAY. See BIRD, full-page program, and subhead in article.

BIRD RESERVATIONS. See BIRD (Government Protection of Birds).

BIRDS *of* PARADISE



King Bird of Paradise

Six-shafted
Bird of Paradise

Wilson's Bird of Paradise



Great Bird of Paradise



King of Saxony Bird of Paradise

BIRD'S-EYE MAPLE, a beautiful form of the wood of the sugar maple, which shows a variation from the usual straight grain of wood by having numerous small, round spots that resemble the eyes of a bird. When smoothed and polished, this wood is highly valued in furniture-making. The hard and red maples are the varieties that most frequently yield bird's-eye wood. It is especially prized in the manufacture of choice writing desks and bedroom furniture.

The peculiar formation noted results from an irregularity in growth. When the bark of the maple is injured, the trunk usually starts to sprout, and a multitude of little twigs appear that have just about enough vitality to keep alive. Each twig is the center of a series of wood rings which give to the wood its characteristic appearance under the skilled hand of the finisher. Special methods of sawing are necessary, that the beauty of the grain may be preserved; a typical method consists in taking short lengths of log to a saw which pares off a thin layer from the surface as the log revolves; a layer 100 feet in length sometimes is thus cut off before the heart of the wood is reached. See **veneer**.

Curled Maple. This is another variation from the straight-grained wood, and it is quite as beautiful as bird's-eye. Here the wood fibers

lie upon each other in ripples, and are somewhat longer than those of the ordinary wood. When polished, curled maple presents most beautiful effects in light and shade. The reason for the formation of curled maple is not known. Beeches and birches also are subject to the same irregularity. Aside from its use for furniture, curled maple is prized as a wood for stocks of guns, as it combines lightness and beauty with great strength and durability. See **MAPLE**.

G.M.S.

BIRDS OF PARADISE, a group of birds that are equaled only by the humming birds in their splendor. There are between forty and fifty species, found in forests of Australia, New Guinea, and other Pacific islands. Strangely, they are related to the family of crows, which are as remarkable for plainness as their famous cousins are for beauty. The name was given to them by early travelers, who wrongly supposed that they were without feet and lived in the air, always keeping their eyes turned toward the sun, and never touching the earth until they died.

Europeans first saw specimens of them in the sixteenth century, when they were carried to Europe by the sailors who made the voyage around the world in the Magellan expedition (1519-1522). In their native haunts, the birds live almost entirely in the tree tops. There

they build their simple nests, and play about the branches, a graceful and agile company; the gorgeously attired males sit and plume themselves to attract the more soberly clad females.

The brilliant plumage of the males presents a bewildering variety of form and color, reminding one of Thoreau's statement that Nature made their feathers to show what she could do. Among the larger species is the *twelve-wired bird of paradise*, so called because out of its short, square tail twelve long, wire-like feathers grow, which curve around toward the sides of the wings. This bird is a foot long, and truly has a coat of many colors; it is purple-bronze on the head, green, black, and purple on the neck, bronze-green on the back and shoulders, and emerald-green on the edges of its violet-purple wings. The tail is also violet-purple, and the breast is a rich yellow.

Not less splendidly arrayed is the *long-tailed bird of paradise*, over a yard in length and having as a distinctive feature a fanlike arrangement of feathers on the sides of the breast, which can be raised to form two half-circles. The ends of these feathers are bright blue and green, and the tail feathers are opal-blue. The *great bird of paradise*, about half the size of the one just described, is a superb creature whose chief glory is a spray of feathers growing out from under each wing. These rise from the body and fall backward in a graceful curve, a showery mass of brilliant color that seems to envelop the bird like a magic fountain. The smallest of the family is known as the *king bird of paradise*, a little creature whose two middle tail feathers terminate in spiral disks of beautiful emerald-green.

The lovely birds of paradise have to pay a heavy penalty for the privilege of wearing glorious plumage, for thousands upon thousands have been sacrificed to man's greed and woman's vanity. The birds are captured for the millinery trade during the mating season, when the males assemble in the trees in groups of from twelve to twenty to display their splendid garments. The bird-catcher shoots them with blunt arrows which stun them, thus permitting their capture without injury to the plumage. The United States prohibits the importation of the plumage of these birds, and the movement to check their cruel slaughter is also progressing rapidly in other countries. See AUDUBON SOCIETY; BIRD.

D.L.

Scientific Names. These birds are placed by scientists in the family *Paradisæidae*. The twelve-wired bird of paradise is classed as *Seleucidés ignotus*; the long-tailed, as *Falcinellus speciosus*; the great, as *Paradisæa apoda*; the king, as *Cincinurus regius*.

BIREME, *bi' reem*. See GALLEY.

BIRGITTA, *beer ge' tah*, a Scandinavian saint. See BRIDGET, SAINT.

BIRMINGHAM, ALA., the largest city of the state and the county seat of Jefferson County, is famous for its steel, iron, and coal industries. It is situated north of the geographical center of the state, ninety-five miles northwest of Montgomery, the capital, and 168 miles west and south of Atlanta, Ga.

Birmingham's location varies from 600 feet to 1,500 feet above sea level, in a valley rich in coal, iron, and limestone; around it lie three famous coal fields, the Warrior, the Cahaba, and the Coosa, in which there are about 240 mines. Iron Mountain, six miles distant, has almost inexhaustible deposits of hematite, a valuable iron ore. The city is partly on the sloping side of Red Mountain, and is attractively laid out, with wide streets, beautiful residences, winding parkways, and numerous parks, the latter comprising 600 acres. In March, 1911, the commission form of government was adopted. Population, 1930, Federal census, 257,657.

History. Early in 1871, following the discovery of the rich natural resources of this section, Birmingham was founded by the Elyton Land Company, who named it for the celebrated steel- and iron-manufacturing city of England. A small iron furnace was built, and mining was begun. In the same year, the town was incorporated. In 1873 it was scourged by cholera; it recovered and was again prostrated by a panic in 1889. Following this period, growth was rapid. The Greater Birmingham law became effective January 1, 1910, and at that time the suburbs of North Birmingham, East Birmingham, Avondale, Woodlawn, East Lake, Wylam, Ensley, Pratt City, West End, and Elyton became part of the greater city.

Institutions. The benevolent institutions comprise nearly twenty hospitals and infirmaries. There are several private schools, Howard College, Birmingham Southern College, the Boys' Industrial School, medical, pharmacy, music, and dental schools, and business colleges.

The first unit of a half-million-dollar municipal stadium is completed, and a handsome new central library plant is also a recent addition to the city.

Industry and Manufacture. The first steel plant in the South was established at Birmingham in 1897, with two open-hearth furnaces, to-day there are several large steel-manufacturing concerns, including the plants of the Tennessee Coal & Iron Company, a subsidiary of the United States Steel Corporation.

Alabama's largest yield of iron ore is obtained from the Birmingham district, and more than one-half of the United States exports of pig iron are from this city. While coal-mining and the manufacture of iron and steel products are the chief industries, the cotton, cottonseed, and lumber interests are important; Birmingham is also one of the leading yellow-pine markets of the South. Including the above, there are 800 manufacturing plants in the city. Other products of importance are cement, fertilizer, clay pipe, and brick, clay being one of the important resources of the district. Here, also, are located the repair shops of the Southern Railway.

Transportation. Nine railroad lines enter the city and provide exceptional transportation facilities; they are the Louisville & Nashville; Mobile & Ohio; Alabama Great Southern; Seaboard Air Line; Central of Georgia; Illinois Central; Atlanta, Birmingham & Coast; Southern; and Saint Louis & San Francisco Interurban and motorbus lines and belt lines reach the suburbs and near-by cities

J.1

BIRMINGHAM, ENGLAND, the third largest city in Great Britain and the second in size in England, London and Glasgow exceeding it in population. It is one of the most important of all manufacturing cities, and is the acknowledged center of the world's hardware industries. Next to Croydon [see ENGLAND (The Cities)], it is the country's largest producer of automobiles.

In addition to these two very large industries, since 1926 a new suburb has been developed, which has been given over to the manufacture of rubber goods. The city is located 103 miles northwest of London, and about seventy-five miles southeast of Liverpool, in Warwickshire. Population, 968,600.

Birmingham was the first large city in England to enter upon comprehensive house-planning, or zoning. In 1926 plans were started to provide a new civic center, to be built around the "Hall of Memory," the city's war memorial. In 1911 the city became the seat of a Roman Catholic archbishop. The water supply is derived from two lakes westward in Wales, and it is conveyed more than seventy miles by aqueducts and pipes.

Birmingham existed before the Norman Conquest (1066). In the Domesday Book (which see) the place is described as "four miles of land with half a mile of woods, valued at £203."

BIRMINGHAM BAPTIST COLLEGE. See ALABAMA (Education).

BIRMINGHAM-SOUTHERN COLLEGE. See ALABAMA (Education).

BIRNEY, JAMES G. See LIBERTY PARTY.

BIRTHDAYS OF FAMOUS PEOPLE. Lists of birthdays of hundreds of the world's men and women will be found in the articles relating to the months of the year. To these the reader is directed.

BIRTH REGISTRATION. See VITAL STATISTICS, subhead.

BIRTHSTONES, certain gems that through custom, imagination, and sentiment are associated with the twelve months of the year, each month having dedicated to it a special stone. Thus, the stone of any month is the birthstone of every person whose birthday falls in that month; the belief that a natal stone is more intimately associated with one's personality than any other stone is very widespread. This belief may be traced to the writings of Josephus, a Jewish historian of the first century of the Christian Era, who found a

connection between the twelve stones of the high priest's breastplate (see *Exodus* XXVIII, 15-20, also article HIGH PRIEST), and the yearly circle of months. Yet the custom of wearing birthstones is of comparatively recent date, as it is supposed to have originated in the eighteenth century, in Poland.

The list of birthstones given below is the one adopted by the American National Retail Jewelers' Association. There are other lists, slightly different, approved by Polish and Jewish jewelers. A comparison of the list here given with the gems mentioned in the adornment of the high priest's breastplate will suggest the changes that the centuries have produced in the popular beliefs about birthstones:

January	Garnet
February	Amethyst
March	Bloodstone (heliotrope) or aqua-marine
April	Diamond
May	Emerald
June	Pearl or moonstone
July	Ruby
August	Moonstone
September . . .	Sapphire
October	Opal or tourmaline
November . . .	Topaz
December . . .	Turquoise or lapis lazuli

Related Subjects. Each gem named in the foregoing list is described in its place in these volumes. See, also, GEMS.

BIRTHWORT. See SNAKEROOT.

BISBEE, ARIZ. See ARIZONA (back of map).

BISCAY, bis' kay, a great bay indenting France, is an eastern arm of the Atlantic Ocean, called by the old Romans the Cantabrian Sea. It is bounded on the east and northeast by France, and on the south as far as Cape Ortegal by Spain; its shore line forms a fairly regular curve about 400 miles long and 300 miles wide. The rugged Spanish coast is indented by bays, but the low and sandy French coast is broken by the great mouths of the Loire, Garonne, Adour, and Charente rivers. Bordeaux, Bayonne, Nantes, Rochefort, and Brest are the principal French ports; the cities on the Spanish coast include San Sebastian, Santander, Bilbao, and La Rochelle. The people who live on the Spanish shore are called Basques. From them the bay takes its name.

On account of its exposed position and diverse currents, the bay is noted for storms, and is especially trying to voyagers. In 1588, the great Spanish Armada (see ARMADA), as it was starting on its career of conquest, encountered a terrible storm on the Bay of Biscay, in which the unwieldy vessels were scattered in all directions, and were assembled again only after several days. Byron in *Childe Harold* says of the bay:

On, on, the vessel flies, the land is gone,
And winds are rude in Biscay's sleepless bay

BISHOP. In the Roman Catholic, Anglican, Greek, and some other Eastern churches, this title is given to one who has jurisdiction over the local churches which constitute his diocese. The office of bishop in the churches named is considered as descending without interruption from the Twelve Apostles, but this order of succession is not accepted by most Protestant churches. In the Methodist Episcopal Church the authority of a bishop is recognized; in this Church the bishops are elected by the General Conference, and after reaching seventy years of age they are placed upon the retired list.

The duties of the bishop vary with different denominations. In general, he has authority over the clergy and various church interests within his diocese. He may call conventions of the clergy, at which he presides, and he may appoint clergymen to churches and for cause may remove them from their positions, or transfer them.

BISMARCK, *biz' mahrk*, N. D. See NORTH DAKOTA (back of map).

BISMARCK ARCHIPELAGO. See PACIFIC ISLANDS.

BISMARCK-SCHÖNHAUSEN, *biz' mahrk shoeh' how zen*, KARL OTTO EDUARD LEOPOLD VON, Prince (1815-1898). When this greatest German statesman of the nineteenth century was nearing the end of life, he said, "I do not want a lying epitaph. Write on my tomb that I was the faithful servant of my master, the Emperor William, King of Prussia." The story of Bismarck's career indicates how truly he spoke. That story shows, too, that through his genius the German people, after centuries of disunion and oppression, were brought together to begin their history anew under the government of a united Empire.

Bismarck was born of a noble Prussian family of Schönhausen, in the district of Magdeburg. At the age of seventeen, he began the study of law and political science at the University of Göttingen; he completed his studies at Berlin, and was admitted to the bar in 1835. After serving his term in the army as lieutenant of the Life Guards, he began to take an interest in local affairs, and in 1846 he became a member of the provincial diet, or legislative assembly, of Saxony; in 1847 he was elected to the Prussian diet.

The following year was the time of a great revolutionary outbreak that swept over all Europe. In Prussia, peace was secured only when King Frederick William IV granted the people a Constitution and promised to rule according to its provisions. During this critical period, Bismarck had been coming to the front as a strong advocate of increased power for the king, and his speeches in the Prussian Parliament in 1849 brought him favorably to the attention of Frederick William. Accordingly, in 1851 his sovereign appointed him representative of Prussia in the Germanic diet at Frankfort, the most important event thus far in his career.

During eight years of service at Frankfort, Bismarck established in his mind the policy which was later to bring about tremendous national changes. He clearly saw that Prussia and Austria, rival leading states in the Germanic Confederation, could never remain in that league on equal terms; the only hope for German unity and freedom was to form a new confederation, with Prussia at the head and Austria excluded from it. How he accomplished this belongs to the story of the birth of the German Empire.

The Making of an Empire. Between 1858 and 1861, Bismarck represented Prussia at the court of Alexander II, czar of Russia. In the latter year he was transferred to Paris by William I, who had just succeeded to the throne of Prussia, and in 1862 he was summoned to Berlin by that monarch to become his Prime Minister and Secretary of Foreign Affairs. "With that day," wrote one historian, "a new era did in truth begin for Prussia and Germany, and so for Europe." From that time, Bismarck worked with one end in view—the unification of the German fatherland. When the Prussian diet refused to work with him in the reorganization of the army, he dissolved that body and carried out his policy without parliamentary authority. In a speech made in 1862, he said, "Not by speeches and resolutions of majorities are the mighty problems of the age to be solved, but by blood and iron." This often-quoted expression was his way of saying that only by war could the jealous German states be brought together, and, in truth, three wars were fought within the next ten years, before his great purpose was realized.

In 1864 Prussia and Austria united against Christian IX of Denmark, forcing him to resign all claim to the duchies of Schleswig and Holstein. No sooner was this war ended than Prussia and Austria began to quarrel over the provinces wrested from Denmark, a dispute that gave Bismarck the very opportunity he craved. Having secured the neutrality of France and made an ally of Italy, he sent the army of Prussia, disciplined to the highest point of efficiency, against the Austrians, and



Photo. Brown Bros.
BISMARCK

in a brief war of seven weeks, Austria was completely defeated.

The next step in Bismarck's program was the establishment, in 1867, of the North German Confederation, a league of the German states north of the Main River, under the presidency of Prussia. In this union, Austria had no place. Bismarck realized, however, that the states south of the Main must come into the Confederation before German unity could be accomplished. He foresaw, too, that a war with France must come sooner or later, for Napoleon III, emperor of the French, fearful of losing his leadership in European affairs, was jealously watching every move in the great historic drama across the Rhine, and was openly opposed to the unification of the German states.

In 1869 France and Prussia became involved in a dispute over the succession to the throne of Spain, and in 1870 they began war. The states north and south of the Main joined together under the standard of William I, and in the triumph of the German arms in that war, Bismarck saw at last the realization of the greatest dream of his life.

The Iron Chancellor of the Empire. Just as Bismarck's personality had dominated affairs throughout the preceding period, so his was the guiding hand in the organization of the empire, of which he became first Chancellor, with the title of prince. In this office, he revealed the same strength of will and purpose that had characterized him as Prime Minister, fittingly expressed in the title that historians gave him—"The Iron Chancellor"—a name which thereafter clung to him.

His genius was conspicuous in home and foreign affairs. He originated those measures in behalf of the working classes that became the foundation of state socialism in Germany, the system known as paternalism. He inaugurated Germany's colonial policy, and did much to extend his country's trade throughout the world; the conference which met at Berlin in 1884 to arrange for the recognition of the Congo Free State in Africa was suggested by him. His one great mistake was his opposition to the Catholic party in Germany, for in this he took an extreme position from which he was forced to recede.

In foreign relations, his policy was one of peace. He kept Germany from becoming involved in the troublesome Eastern Question,

and endeavored to promote security of the fatherland by forming the Triple Alliance, which guaranteed him the support of Austria and Italy in case of aggression on the part of Russia or France. The Triple Alliance remained in force until the great conflict that set all Europe aflame in 1914; then, in the World War, Italy joined the Allies and fought against Germany.

Bismarck remained at the head of affairs throughout the reign of William I and during the short period when Emperor Frederick III ruled. In 1888 William II came to the throne, a ruler possessed of as dominating a personality as Bismarck himself. Numerous disagreements followed, and in 1890 Bismarck tendered his resignation and retired to his estates at Friedrichsruh.



MEMORIAL IN HAMBURG

Related Subjects. The following articles in these volumes will throw much light on the life and work of Bismarck:

Franco-German War
Germany (History)
Schleswig-Holstein
Seven Weeks' War
Triple Alliance
William (I and II, Germany)

BISMUTH, *biz' muth*, a grayish-white metal with a slightly red tint. Small quantities are found in the pure state, but most of that used in the arts is obtained

from ores. Its symbol (see CHEMISTRY) is *Bi*. Bismuth is purified by heating on an inclined shelf, so that the metal will drain away from the impurities. It is brittle, harder than lead, and 9.9 times heavier than water. One of its chief uses is in the manufacture of "fusible metals," or mixtures that melt at a low temperature. For example, fusible metal, formed of eight parts bismuth, five parts lead, and three parts tin, melts at 202° F., or ten degrees below the boiling point of water. This metal can be melted in a piece of stiff paper held over the flame of a candle or lamp without burning the paper. Fusible metals are used for plugs in steam boilers, to prevent explosions, and in automatic sprinkler systems designed for fire protection in large buildings.

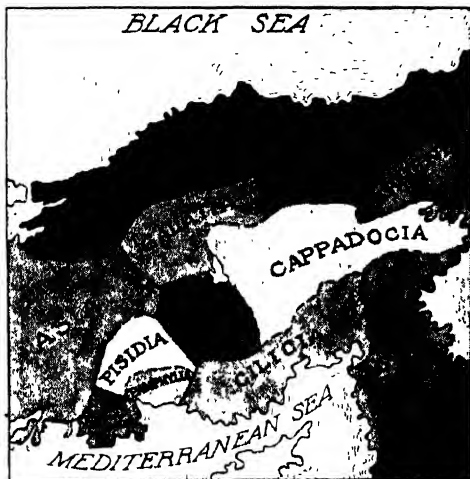
Some compounds of bismuth are used in the manufacture of paint, and the subnitrate, a white powder, is a remedy for dyspepsia. Other compounds of bismuth are finding application as therapeutic agents. Its low toxicity (degree of being toxic, or poisonous) is favorable for its use in medicinal preparations.

T.B.J.

BISON, the American buffalo. See **BUFFALO**, subhead.

BISTRE, or **BISTER**. See **SOOT**.

BITHYNIA, *bith in' i ah*, an ancient country of Asia Minor, bounded on the north by the Euxine, the old name for the Black Sea, and separated from Europe by the Sea of Mar-



LOCATION OF BITHYNIA

mora and the Bosphorus. In early times, the Greeks established in this region the colonies of Chalcedon and Heraclea. Later, Nicaea, Brusa, and Nicomedia were flourishing cities, the last-named being the royal residence of the Emperor Diocletian. Bithynia became a Roman province in 74 B.C., and under Trajan was governed by Pliny the Younger. The latter wrote a famous letter to Trajan respecting the treatment to be given the Christians of the province, which shows that Christianity gained a strong foothold there. See ASIA MINOR.

BITTERN, a marsh bird of the heron family, the most familiar species being the common bittern of North America, whose remarkable, dismal cry, sounding like the blow of an ax on a stake, has given it various local names, as *stake-driver*, *mire-drum*, *bog-pumper*, *thunder-pump*, etc. This bird nests in lonely marshes and swamps, and in summer is found north of Virginia as far as the fur-bearing sections of Canada; in winter, it ranges from Virginia and California southward. It is from twenty-three to thirty-four inches in length, and has a shorter neck and shorter legs than the heron, but longer toes. The upper parts of its body are brownish-buff, spotted with reddish-brown and black, whence its occasional name of *freckled heron*. Its under parts are pale buff striped with brown, and its legs are yellowish-green. Three to five brownish-drab eggs are laid in a crude nest that is merely a thick mat of coarse grass placed on the ground.

The bird is a solitary creature of many peculiar habits. In the daytime, it sometimes stands motionless for hours, on the lookout

for frogs, lizards, large-winged insects, and meadow mice, on which it feeds, and at night it becomes most active. Its weird call of *pump-er-lunk, pump-er-lunk*, which comes



Photo: Visual Education Service

THE BITTERN

sounding over the marshes with solemn regularity during the breeding season, has given rise to the story, untrue, that the bird makes its call with the bill in mud or water. When it wishes to avoid being seen, it points its bill skyward and stands motionless, its plumage blending perfectly with the rushes. D.L.

Scientific Names. The common bittern belongs to the family *Ardeidae*. It is classed as *Botaurus lentiginosus*. A much smaller species, of similar habits, called *least bittern*, is *Ardeola exilis*.

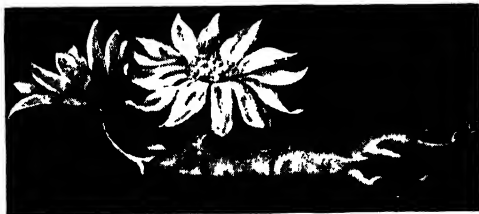
BITTERNUT, a tall, handsome species of hickory, so called because of its bitter-tasting kernel. Its botanical name is *Carya cordiformis*. This tree is usually found in low, wet woods and swamps, and is also called *swamp hickory*. It is found in latitudes of Ontario and Maine to Florida, and west to Minnesota, Nebraska, and Texas.

The bitternut grows to a height of from sixty to a hundred feet, and has several marked peculiarities that set it apart from other hickories. Its flattened, tapering, yellow buds are borne the year round, and it has the smallest leaflets and the slenderest twigs of all the

hickory group. The nut is smooth and round, its thin shell enclosing a plump, white kernel, which is so bitter that no creature of the woodland will touch it. The wood of the tree, which is hard, tough, and close-grained, is valued for hoops and as a fuel. The attractive appearance of the bitternut and its value as a shade tree are bringing it more and more into use in parks and landscape gardens. See HICKORY. B.M.D.

BITTERROOT, a plant of the dogbane family which grows in Canada and North-western United States. The name comes from its long, fleshy, tapering root, which, though bitter, is a nutritious article of food, esteemed both by the whites and the Indians. It is locally known as *tobacco root*, because of its tobacco-like odor while cooking. The plant has juicy green leaves and a fleshy stalk bearing a single rose-colored blossom that remains open only in the sunshine.

This plant has given its name to a range of mountains between Montana and Idaho,



BITTERROOT

to a forest and a river in Montana, and to a fertile and beautiful valley in Montana east of the Bitterroot range, ninety miles long and seven miles in width. The bitterroot is also the state flower of Montana. B.M.D.

Scientific Name. The bitterroot belongs to the family *Portulacaceae*. Its botanical name is *Lewisia rediviva*.

BITTERS, a term usually applied to liquid compounds containing tonic properties, taken as appetizers. The bitters in general use include angostura, quassia, cinchona, orange, and wild cherry. They are usually taken with spirits of wine—a few drops of the bitters in a small glass of the liquor. True bitters

act by affecting the taste buds in the tongue (see TASTE). Stimulation of the appetite in this manner usually causes the digestive juices to flow more freely.

To get the benefit of bitters, one should not disguise the taste. Many so-called bitters are composed mainly of alcohol, and have little or no medicinal value. They should never be used except on the advice of a physician.

BITTER SEA. See ADRIATIC SEA.

BITTERSWEET, OR **WOODY NIGHTSHADE**, an interesting member of the nightshade, or potato, family, native to Europe and Asia, but now grown generally throughout Eastern United States and in Canada. Its stem is a weakling; it chooses for its dwelling place moist thickets or edges of ponds, where

it may climb upon the surrounding vegetation or lazily creep along the ground. The dark-green leaves show a variety of form; some are heart-shaped, others have earlike divisions at the base, and still others have winglike lobes (see illustration, under NIGHTSHADE). The blossom much resembles that of the potato, though it is smaller, and is blue or purple, with a yellow center.

The special attraction of the plant, however, is its fruit, or egg-shaped berries, that change, as they ripen, from green to yellow and then to ruby-red. Berries in all stages of growth appear in the same cluster, and the mingling of the different colors seen against the deep green of the leaves is delightful to the eye. No one should be tempted by the beauty of the fruit, however, as the berries are poisonous. The twigs of bittersweet yield a fluid that helps to deaden pain; this is also used as a remedy for some skin diseases. B.M.D.

Scientific Names. Bittersweet belongs to the family *Solanaceae* (see NIGHTSHADE). Its botanical name is *Solanum dulcamara*. *S. nigrum*, the common nightshade, is a closely related species. The false bittersweet, *Celastrus scandens*, is not a member of the nightshade family.

BITTERWEED. See RAGWEED.

BITUMEN, *bi tu' men*, a name given to a number of mineral substances which are composed chiefly of hydrogen and carbon, such as naphtha, petroleum, mineral pitch or mineral tar, and asphalt. Bituminous coal, or



Photo Visual Education Service

BITTERSWEET

"soft coal," contains a large proportion of bitumen. All forms of bitumen will burn, and will produce a great volume of smoke unless abundantly supplied with air. Bitumen, in the various forms mentioned, is widely distributed over the earth.

Related Subjects. The reader is referred in these volumes to the following articles:

Asphalt	Coal (Bituminous)
Carbon	Petroleum

BITUMINOUS, *bi tum' in us*, **COAL**. See **COAL**.

BI'VALVE, a class of mussels. See **SHELL**; **OYSTER**.

BIWA, *be' wah*, **LAKE**. See **JAPAN** (Physical Features).

BIZERTA, *be zair' tah*. See **TUNISIA**.

BIZET, *be za'*, **GEORGES** (1838-1875), a French music composer whose real name was **ALEXANDRE CÉSAR LEOPOLD**. He is remembered almost entirely for his brilliant and popular opera, *Carmen*. Bizet studied at the Paris Conservatory, where he distinguished himself in 1857 by winning the Prize of Rome, the highest honor the institution could award. After further study in Italy, he began the composition of operatic music, but *Carmen*, produced in 1875, shortly before his death, was the only work that received permanent recognition. This bright and melodious opera has enjoyed uninterrupted popularity. See **OPERA** (Some of the Famous Operas).



EDWARD LEONARD BROS.

BIZET

BJÖRNSON, *byurn' son*, **BJÖRNSTJERNE** (1832-1910), one of the most distinctively national of all Norwegian writers, famous especially for his tales of Norse peasant life. For him his countrymen have a respect that is little less than worship; to them he remains to this day the personification of their nation. Critics of other lands recognize in him the greatest novelist of Norway, one of its greatest poets, and its foremost dramatist except Ibsen. He had none of the pessimism of Ibsen, but showed in all his works a persistent, though not a sentimental, optimism. He was a patriotic politician as well as a literary artist. He took an active part in every movement for the advancement of his country, and was very influential in bringing about the separation of Norway from Sweden, in 1905. See the articles **SWEDEN**; **NORWAY**.

He was born at Kvikne, and was educated at the University of Christiania. After leaving that institution, he earned a reputation as a journalist before the appearance of his first play, *Between the Battles*, and his first peasant novel, *Synnøve Solbakken*. From 1857 to 1859 he was director of the Bergen theater; from 1860 to 1863 he traveled in Europe, and in 1880-1881 he visited the United States on a lecture tour. For his works, many of which have been translated into English, he was awarded the Nobel prize for literature in 1903.



Photo: U & U

Principal Works. He wrote, besides the books mentioned above, the novels *Arne*, *The Fishermayden*, *A Happy Boy*, *The Bridal March*, *Dust*, *The Heritage of the Kurts*, and *In God's Way*; the dramas *Mary Stuart in Scotland*, *The Newly Wedded Pair*, *The New System*, *A Glove*, and *Dagelannet*; and many poems.

BJÖRNSON

The greatest of Norway's novelists.

BLACK, commonly referred to as the darkest of all the colors. In the theory of color, white is produced by all the colors mixed in the proportion in which they are found in the solar spectrum and the rainbow, and black is produced by the absorption of all colors; in other words, then, black is really the absence of color. Of course, in practice this does not hold; all objects absorb some color and reflect some, but black objects reflect the smallest proportion. See **COLOR**; **SOLAR SPECTRUM**.

A.L.F.

Symbolism of Black. Black is the conventional mourning color among Europeans and Americans. This word chiefly has unpleasant associations. We speak of *black looks* and *black despair*, *black art* and *black magic*. In history, days on which great disasters have occurred are often designated as black.

BLACK ALDER. See **WINTERBERRY**.

BLACK ART. See **NECROMANCY**.

BLACK BEETLE. See **COCKROACH**.

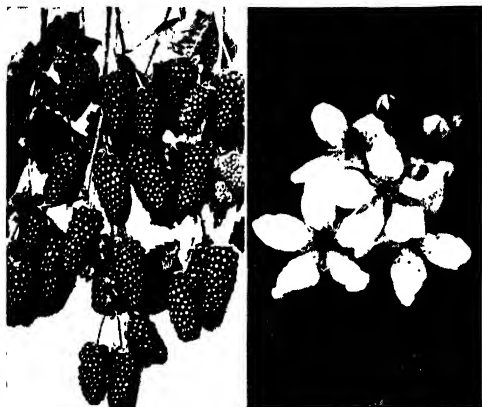
BLACKBERRY, a vinelike shrub that bears one of the most important and profitable of small fruits. Blackberries are cultivated in most fruit-growing localities for jams, jellies, preserves, wine, and dessert, but their cultivation elsewhere is little attempted. Wild blackberries are favorite small fruits in many countries, and in Great Britain a species called *bramble* is widely used. The blackberry is closely related to the raspberry, but the former retains its fleshy, conical receptacle when picked, while the raspberry separates from the receptacle. The dewberry is also much like

the blackberry, but it grows on a trailing vine, while the blackberry grows upright. The dewberry is sometimes called the "running blackberry." See DEWBERRY.

Blackberries attain their best growth in a deep, mellow, drought-resistant loam. They

The yellow-headed blackbird breeds on the Canadian plains and as far north as the Mackenzie district.

The favorite nesting places of blackbirds are in the rushes of a pond, lake, or slough; more rarely, they nest in a low bush on the edge of



Photos. Visual Education Service

BLACKBERRY

The fruit and the blossom

have a tendency to form impenetrable tangles or thickets, and are kept under control by pruning, trellising, and cultivation. Propagation is carried on through suckers and root cuttings. Numerous varieties have been developed; Burbank created a transparent white variety, as well as a blackberry with a thornless stalk. See BLIGHT.

B.M.D.

Classification. The blackberries, wild and cultivated, are species of the genus *Rubus*, in the rose family, *Rosaceae*.

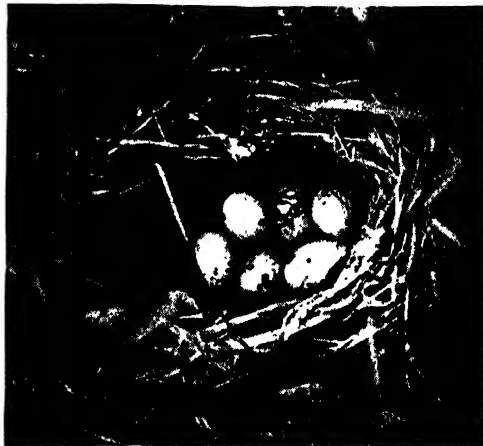
BLACKBIRD, any one of several species of birds whose distinguishing feature is the glossy black coat of the male birds. Of the North American blackbirds, none is more familiar than the red-winged variety, known also as the *swamp black-bird*, *red-winged oriole*, and *red-winged starling*.

The redwings are from seven and one-half to ten inches in length; they receive their name from the scarlet, yellow-tipped shoulders of the male, which otherwise is as black as coal. The female, as is true of most birds, is somewhat commonplace in appearance, with blackish-brown upper parts, streaked with rusty black and gray, and dusty-white under parts, streaked with brown. Redwings are found in most parts of North America, in the vicinity of swamps or marshy streams.



Photo Visual Education Service

RED-WINGED BLACKBIRD



Photos U & U

RED-WINGED BLACKBIRD

Nest, eggs, and young

a pond, or the moist grass of the marshes. In the nest, which is made of grass, leaves, and mud, are deposited from three to six eggs, pale blue in color, with streaks and spots of black or purple. They are cheerful, sociable birds, given much to gathering in flocks on trees and bushes in fall and spring, when in a great chorus they utter their plain song for half an hour at a time. In the breeding season, they utter a harsh "chack, chack," if their nests are approached. Blackbirds are



useful in that they devour insects and weed seeds; in some sections they are injurious to growing grain, and where they are too numerous, control may be necessary. D.L.

Scientific Names. Blackbirds belong to the family *Icteridae*. The red-winged blackbird is *Agelaius phoeniceus*. The yellow-headed is *Xanthocephalus xanthocephalus*.

Related Subjects. For other familiar species of blackbirds, see COWBIRD; CROW BLACKBIRD. See, also, BIRD (Migration of Birds).

BLACK BROTHER, a peak in North Carolina (which see).

BLACK DEATH. See PLAGUE.

BLACK EARTH BELT. See RUSSIA (Agriculture).

BLACK-EYED SUSAN, OR **YELLOW DAISY**, is a pleasing wild flower found in dry fields and along the byroads and highways almost everywhere in temperate regions. The flowers have orange-yellow rays, or petals; gaily they advertise to the bees and butterflies the wealth of nectar and pollen in their purple-black centers. One flower head grows at the top of each rough, hairy stem. The leaves, too, are stiff and hairy, and are placed alternately along the stems. It is difficult to pick these inviting flowers without pulling up the whole plant, because the stems are tough and rigid. The flowering season is from May to September. See illustration, page 781. B.M.D.

Scientific Name. The plant belongs to the family *Compositae*. Its botanical name is *Rudbeckia hirta*.

BLACKFOOT. See INDIANS, AMERICAN (Most Important Tribes).

BLACKFOOT MOUNTAIN. See GLACIER NATIONAL PARK.

BLACK FOREST, a mountainous district in the southwestern part of Germany, heavily wooded with black fir trees, from which the forest takes its name. The district is not a political division, but spreads over about two-thirds of the southern part of Baden and a section of Eastern Württemberg, and covers an area of about 1,844 square miles. It runs almost parallel with the River Rhine for eighty-five miles, and forms an elevated chain of plateaus, rather than a series of isolated peaks. The highest summit is Feldberg, 4,900 feet

above sea level. The slopes contain many lakes and streams, in which the Danube, Neckar, Kinzig, and many smaller rivers have their sources. The principal mineral found is iron.

The region is noted for its mineral springs, which have led to the establishment of numerous watering places and health resorts, of which Baden-Baden is the most famous. The forests yield much timber, especially the pine of the black fir. The region is being continually reforested by thorough German methods.

The manufacture of wooden toys, clocks, and musical instruments is the most important industry of this section. The inhabitants of the forest preserve a quaint simplicity in habits, and the district is rich in old legendary associations.



Photo Visual Education Service

YELLOW-HEADED
BLACKBIRD

Below, the typical
nest of this bird



BLACK FRIDAY, a

term which refers to two different Fridays in the history of the United States, each of which ushered in a series of panics.

The first Black Friday was on September 24, 1869, when Jay Gould and James Fisk, Jr. attempted to create a "corner" by buying all the gold contained in the New York City banks. The market value of gold had been steadily rising for several days, and speculators were aiming to carry it still higher in price. On Friday the whole city was in a state of tremendous excitement, when gold rose to 162½, and was still rising; a possibility seemed imminent that business houses would be closed, as no one knew what prices goods should bring. At this exciting time, \$4,000,000 was taken from the United States Treasury and placed on the market by Secretary Boutwell to break the "corner," and the value of gold immediately fell, not, however, without leaving the speculators richer by almost \$11,000,000.

The second Black Friday was on September 19, 1873, when the New York Stock Exchange reported numerous failures, which precipitated what is known as the panic of 1873.

BLACK GUM. See PEPPERIDGE.

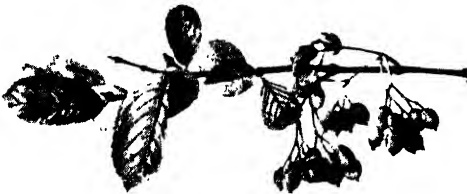
BLACK HAW, OR **STAG-BUSH**, an ornamental shrub belonging to the honeysuckle family, found in dry or moist locations from Connecticut to Michigan, Kansas, and south-



Photos Visual Education Service,
Saint Clair

BLACK-EYED SUSAN

ward. Tall specimens of black haw reach a height of fifteen feet. The shrub may be recognized by its spreading, rather stout branches; reddish, downy winter buds, and oval, bluish-black berries, which are covered with a soft bloom. Its pure-white flowers are



BLACK HAW

very attractive, and the plant is often used in landscaping. The dried bark has medicinal properties.

B.M.D.

Scientific Name. The black haw belongs to the family *Caprifoliaceae*. Its botanical name is *Viburnum prunifolium*.

BLACK HAWK (1767-1838), a chief of the Sac Indians, and one of the most persistent enemies of the white men in their westward progress. He was born at Kaskaskia, Ill., and became chief of his tribe in 1788. From the beginning of his active career he showed himself strongly opposed to any concessions to the whites. Despite his influence, the Sacs and Foxes, in 1804, agreed to give up to the United States their lands east of the Mississippi River; but Black Hawk repudiated the contract, declaring that the chiefs had been made drunk before they signed the documents.

During the War of 1812, Black Hawk, tempted by British agents, joined the English with about 500 warriors, but soon retired from their service. In 1823 most of the Sacs and Foxes, under the leadership of Keokuk, removed to their reservation beyond the Mississippi River; but Black Hawk, with part of his tribe, refused to emigrate, and he fought with the whites what is known as the Black Hawk War. After several encounters, the Indians were defeated, and Black Hawk and his two sons were taken captive. The three were confined in Fortress Monroe until 1833, and upon their release they joined the tribe in the reservation near Fort Des Moines.

In 1911 there was erected near Oregon, Ill., on a bluff which overlooks the picturesque valley of Rock River, a massive reinforced concrete statue in honor of this indomitable Indian chief. The figure is fifty feet in height, and was constructed by Lorado Taft. It is not a portrait statue, for it presents features from more than one Indian tribe, but its simple strength and majesty and its prophetic gaze down the valley once dominated by this grim warrior give it a very real significance.

BLACKHEAD. See ACNE.

BLACK HILLS. For many years this region was known only as one of the richest gold-mining sections of the United States. Recently, however, the natural beauty of the hills has made them a favorite vacation ground, particularly for automobile tourists.

Called the Black Hills because their thick covering of pines gives them that color, these low mountains cover about 6,000 square miles



BLACK HAWK



Photo Portland Cement Co.

THE GREAT STATUE

This majestic figure, the work of Lorado Taft, is of concrete and stands fifty feet in height.



Photo U & U

A SCENIC SPOT IN THE BLACK HILLS DISTRICT IN SOUTH DAKOTA
Strangely eroded rock formation lining the Needles Highway leading to Sylvan Lake

in South Dakota and extend into Wyoming. The highest point, Harney Peak, has an elevation of 7,240 feet.

The territory was purchased from the Indians in 1876, and extensive mining operations were begun in the following year. Gold, silver, copper, lead, iron, and a number of valuable building stones are obtained in the region. The great Homestake mine, one of the largest in the United States, is located at Lead, in the Black Hills.

Two national forest reserves, a state park, and a national park, the latter containing Wind Cave, occupy most of the region; Mount Rushmore has been established as a patriotic memorial. Most attractive to visitors are the deep canyons, thick pine woods, and clear mountain streams, which give the mountains a beauty sometimes compared to that of the famous Black Forest in Germany.

Related Subjects. The reader is referred in these volumes to the following articles:

Custer, George A.
Mount Rushmore Memorial

Parks, National
South Dakota

BLACK HOLE OF CALCUTTA, a small room, 14 feet 10 inches wide and 18 feet long, in an old English fort of Calcutta, India. On June 20, 1756, Surajah Dowlah and his men,

after looting the city, captured the fort. On that intensely hot night in June, 146 men were thrust as prisoners into that one small room which had but two tiny windows, and by morning only twenty-three were alive to tell of their terrible experience. Macaulay vividly described the Black Hole in his essay *Clive*. See INDIA (History).

BLACKING, for shoes, is commonly formed of ivory black, boneblack, or lamp black, in a liquid mixture of oil, vinegar, molasses, or sugar dissolved in water, and sulphuric acid. The chemical combination of the acid, the sugar element, and the black gives the blacking its power to adhere to leather. The difference between liquid and paste blackings is in the amount of vinegar content. After blacking is applied to leather, a high polish may be imparted by rubbing briskly with a cloth or soft brush.

BLACK LEAD. See LEAD.

BLACKLIST, a list of names of persons thought deserving of censure or punishment, or considered as untrustworthy as workmen, or classed as delinquent debtors. Lists of the latter were in an earlier day published by mercantile agencies and others for the protection of employers or tradesmen. To a very general

extent, blacklists were formerly used by employers who wished to warn others against the employment of persons whom they considered objectionable. As used in connection with labor problems, the term referred to lists of persons who were considered undesirable by labor unions or by employers. Activity in the cause of unionism by a prospective employee was frequently objected to by an employer, while the unions objected to men for exactly the opposite reasons, namely, that such persons had refused to join the union or obey its orders, or in the event of strikes had assisted as strike-breakers.

Blacklists were distributed secretly, because the persons responsible for them did not care to be known, and because stringent laws have been very widely passed making their compilation and distribution illegal. Better understanding between employers and laborers of late years has decreased the temptation to maintain such lists, even without the pressure of law. See LABOR ORGANIZATIONS.

Trading with the Enemy. The term *blacklist* also refers to enemies at war. In the World War, for example, Great Britain and others of the Allies published lists of persons and firms who were "by reason of enemy nationality, sympathy, or association, found to be zealous to advance the cause of the enemy and to make their trading or profits in trade a means to this end." Trading with the enemy is illegal under English common law. The publication of these lists, which included some firms in the United States, was regarded by many as an invasion of neutral rights, and called forth a protest from the United States government.

BLACK LOCUST. See HONEY LOCUST.

BLACKMAIL, a term in law applied to an attempt to extort money from a person under threat of exposure of an alleged past disgraceful offense or of some damaging secret, or to impute to him some physical and private imperfection contrary to facts. Whether successful or not, blackmail is an offense punishable by imprisonment or fine, or both.

Derivation. In olden times, blackmail was a certain amount of money, corn, cattle, or other thing of value, paid to men allied to robbers for protection from pillage; from that ancient usage, the present meaning of the term was derived.

BLACK MED'IC. See SHAMROCK.

BLACKMORE, RICHARD DODDRIDGE (1825-1900), an English novelist whose name would now be forgotten were it not for his *Lorna Doone*, a vigorous and beautifully written story of Exmoor and the neighboring district, the home of the Doone family. Blackmore was born at Longworth, in Berkshire; he was educated at Oxford, and began the practice of law in 1852. Failing health forced him to abandon his chosen profession, and, settling on a fruit farm up the Thames from London, he devoted his time to writing.

What He Wrote. Among the several novels from his pen are *Cradock Nowell*, *The Maid of Sker*, *Alice Lorraine*, and *Kit and Kitty*, none of which has the charm or literary merit of *Lorna Doone*.

BLACK MOUNTAINS, a range of mountains extending across North Carolina into the northern parts of Georgia and South Carolina. Their direction is nearly east and west, and they contain the highest peaks in the Appalachian system, among which are Mount Mitchell, 6,711 feet, and Balsam Cone and Hairy Bear, the latter exceeding 6,500 feet in altitude. Their sides are covered with evergreen forests, from which they take their name. Many of the valleys are highly fertile. See APPALACHIAN MOUNTAINS.

BLACK POWDER. See GUNPOWDER.

BLACK PRINCE, THE. See EDWARD, THE BLACK PRINCE.

BLACK RACER. See BLACKSNAKE.

BLACK RIVER. See NORTH CAROLINA (Rivers and Lakes).

BLACK ROT. See GRAPE (Methods of Culture).

BLACK SEA, called by the ancients PONTUS EUXINUS, is a sea situated between Europe and Asia, bounded by Russia, Bulgaria, Rumania, and Turkish dominions in Europe and Asia.



BLACK SEA

Very important commercially, though subject to violent storms and dangerous breakers.

The name is partially justified by its heavy fogs in winter, which give a dark aspect to the water. It is connected with the Mediterranean by the historic Bosphorus, the Sea of Marmora, and the Dardanelles, and by the Strait of Kertch with the Sea of Azov, which is, in fact, only a bay of the Black Sea. It has a length of 750 miles, a greatest width of 380 miles, a maximum depth of 7,000 feet, and it covers an area of 180,000 square miles, somewhat greater than that of the state of California. The water is not so clear as that of the Mediterranean, and it contains less salt, on account of the many large rivers flowing into it, among which are the Danube, Dniester, Dnieper, and Don. The depths are lifeless, owing to the presence of chemicals not conducive to marine life.

During January and February the shores from Odessa to the Crimea are ice-bound. There are few islands, and those are of small extent. The most important ports are Odessa, Kherson, Sebastopol, Batum, Trebizond, Sinope, and Varna. The sea is of great commercial importance to Russia, as it furnishes an outlet for the agricultural region of the south, but its exit to the Mediterranean Sea and the ocean was for years closed by the Great Powers of Europe to the battle fleet of Russia. At the outbreak of the World War, this great sea assumed first importance, and on it many battles occurred between Russian and Turkish vessels. The attempted forcing of the Dardanelles by the Allies to permit free access to the Mediterranean for Russian warships failed utterly. By the Treaty of Lausanne in 1923, between the Allies and Turkey, the Black Sea was internationalized.

Related Subjects. Connected more or less intimately with the Black Sea are the following topics.

Azov	Lausanne, Treaty of
Bosporus	Marmora
Dardanelles	World War

BLACK SHIRTS, a name applied to members of the Fascisti in Italy. See FASCISM and THE FASCISTI; ITALY (History: Italy under Fascism); MUSSOLINI, BENITO.

BLACKSNAKE, OR **BLACK RACER**, a swift, agile snake common in North America from Southern Canada to Florida and westward to the prairie regions. It has a slender body, approaching six feet in length. There are many



Photo Visual Education Service

THE BLACKSNAKE

slight color differences, but the typical species of the East is uniformly slaty black in color, with white chin and throat. A different color variety, called the *blue racer*, is found west of the Mississippi River. The blacksnake moves on the ground with the greatest swiftness, but is equally agile in climbing trees or in swimming. It has been reputed to be the especial enemy of the rattlesnake and to be able to kill it by crushing, but these statements are wholly unfounded.

This snake kills its prey of birds, frogs, small mammals, and garter snakes by eating them, but it does not crush them, and it never attacks snakes of its own size. It also eats birds' eggs

and insects. It is harmless to man, and prefers running away to fighting, though if goaded it will defend itself bravely. Blacksnakes are easily tamed, and some specimens show great docility and intelligence. L.H.

Scientific Names. The blacksnake belongs to the family *Colubridae*. Its specific name, *Zamenis constrictor*, was given it because of the erroneous idea of its crushing powers, referred to above. The blue racer is *Z. constrictor flaviventris*.

BLACKSTONE, SIR WILLIAM (1723-1780), a distinguished English judge and writer on law, whose most famous work, *Commentaries on the Laws of England*, has had a wider influence than any other treatise on law in the English language. He was educated at Oxford University, and was admitted to the bar in 1746.

He first attracted attention by a course of lectures delivered at Oxford in 1753, and when, five years later, a new professorship of law was established at the university, he was given the appointment. The lectures delivered at this time established his fame, and his progress thereafter was rapid. He resigned his professorship in 1766, and four years later was knighted and appointed justice of the court of common pleas. Until his death, he was occupied with his duties as judge and as an advocate of prison reform.

Blackstone's *Commentaries*, made up of his Oxford lectures, furnished the model for all later English and American commentaries. For a century after Blackstone's death, it was practically the only textbook on law, and to-day is regarded as a leading authority.

BLACKTAIL. See MULE DEER, REINDEER.

BLACKTHORN. See SLOE.

BLACK WARRIOR RIVER. See ALABAMA (Rivers).

BLACKWELL, ELIZABETH (1821-1910), the first woman to receive a medical diploma and take up the profession of medicine in the United States. When she was ten years of age, her parents moved from Bristol, England, her birthplace, to New York, and later they settled in Cincinnati, where she taught school for several years. After numerous difficulties, due to prejudice against women in the profession, she was graduated in medicine with highest honors, in 1849. She continued her studies in Paris and London, and on her return to America settled in New York, where she acquired an extensive practice. In 1854 she opened a hospital for women and children, and in 1868, with her



Photo Brown Bros

SIR WILLIAM BLACKSTONE

sister Emily, also a physician, founded the Woman's Medical College of the New York Infirmary.

BLACKWELL'S ISLAND, now known as Welfare Island (which see).

BLACK WIDOW, the strange name for the most poisonous American spider. See **SPIDER**.

BLACKWOOD TREE. See **ROSEWOOD**, for classification.

BLADDER. See **KIDNEYS**.

BLADDERWORT, the common name of a genus including many interesting water or marsh plants. The aquatic forms, characterized by highly dissected leaves, are found in ditches, pools, and marshes throughout the world. A dozen or more species with yellow or bluish flowers occur in the United States and Canada. The name refers to little water-filled bladders found on the stems and leaves. At blossoming time, these organs fill with air and raise the flowers above the surface of the water. After the flowering, the bladders again fill with water, and the plants are submerged when the seeds ripen. Bladderworts are carnivorous plants (which see). Each bladder is equipped with a valvelike door through which insects enter when looking for food or shelter. The entrapped creatures serve as food for the plants. If a ditch or pool dries up, the bladders hold moisture enough to keep the bladderwort alive for some time.

B.M.D.

Scientific Names. The bladderworts form the genus *Utricularia* in the family *Lentibulariaceae*.

BLAINE, *blane*, JAMES GILLESPIE (1830-1893), an American statesman whose personality, keenness of intellect, power in debate, and profound knowledge of history and of human nature made him one of the most influential political leaders for nearly two decades. He was born at West Brownsville, Pa., was graduated at the age of seventeen from Washington College, Washington, Pa., and during the next few years taught school and studied law. After settling in Maine in 1854, he became editor of the *Kennebec Journal* and later of the more influential *Portland Advertiser*, and in 1858 was elected to the lower house of the state legislature.

Blaine's Public Career. Four years later, upon election to Congress, Blaine began his long career as a national Republican leader. Between 1860 and 1874, he was Speaker of the House. In the Presidential election of 1876, Blaine was a candidate for the Republican nomination, but failed to secure that honor by twenty-eight votes. Charges of corrupt practices in securing legislation in favor of certain railroad projects had been made against him, and his defense was not satisfactory to many of his own political faith. Therefore, he never again had the undivided support of the Re-

publicans, and the great ambition of his life was never realized.

In 1877 Blaine entered the United States Senate, where he zealously championed the cause of protective tariff, and labored for the advancement of American shipping and for subsidies for American industries. In the Republican convention of 1880, his friends fought for his nomination through thirty-six ballots, finally giving their support to the "dark horse" of the convention, James A. Garfield. After the latter's inauguration as President, Blaine was appointed Secretary of State, but he held office only eight months because of the death of the President and the reorganization of the Cabinet by the new President, Chester A. Arthur.

After three years of retirement, Blaine returned to public life as the Republican candidate for the Presidency, but was defeated in the election by Grover Cleveland, after a campaign unequaled up to that time in bitterness of personal attack. He thereupon devoted himself to literary work; in 1886 he published the second volume of *Twenty Years in Congress*, the first volume having appeared in 1884. It is a valuable historical record.

Refusing to permit his friends to press his candidacy for the nomination in 1888, he entered President Harrison's Cabinet as Secretary of State in 1889, and served with distinction until his resignation in 1892. With his administration of the State Department are connected the treaty with Germany concerning the Samoan Islands and the assembling of the first Pan-American Congress. He also negotiated a large number of reciprocity treaties for the encouragement of American commerce, and vigorously upheld the dignity and honor of his country in its foreign relations. A last and unsuccessful attempt was made to secure his nomination for the Presidency in the Republican convention of 1892.

B.M.W.

Related Subjects. The reader is referred in these volumes to the following subjects.

Pan-American Congress	Samoa
Reciprocity	Subsidy

BLAIR, FRANCIS P. See **STATUARY HALL**.



Photo U & U

JAMES G. BLAINE

Named the "Plumed Knight" by Robert G. Ingersoll in his speech in the 1876 convention at Cincinnati, in which he nominated Blaine for the Presidency of the United States. The name electrified the audience and clung to Blaine as long as he lived.

BLAKE, EDWARD (1833-1912), a Canadian lawyer and statesman, was born at Adelaide, Ontario, on October 13, 1833, but to the day of his death he was undeniably Irish. His father had emigrated from County Galway to Ontario in 1832, and the son, exactly sixty years later, returned to Ireland, and later was elected a member of the British Parliament.

After graduation from Upper Canada College and the University of Toronto, Blake was called to the bar in 1856, and soon won a large practice. He was elected to the first Dominion Parliament in 1867, and at the same time sat in the Ontario legislature. He led the Liberal opposition in the legislature until 1871, when he was Prime Minister for a few months. He declined the leadership of the Liberals in Parliament, but in 1873 accepted a ministership without portfolio in Alexander Mackenzie's Cabinet. His health was uncertain during the next few years, but he held the portfolio of Minister of Justice long enough (1875-1877) to take the chief part in planning the organization of the Dominion Supreme Court. From 1880 to 1887 he was leader of the Liberal Opposition in the Dominion House of Commons. Then he resigned this position, but still sat in the House until 1891, when he withdrew from public life.

In the field of imperial politics, which he entered in 1892 at the request of the Irish Nationalists, Blake rendered good service to the cause of Home Rule. He sat in the British Parliament until 1907, when failing health led him to return to Canada. In addition to his political activities, Blake practiced law and appeared in many important cases in England and in Canada. He was interested in education; he founded several scholarships in political science in the University of Toronto, and served a term as chancellor of that institution. G.H.L.

BLAKE, ROBERT (1599-1657), a famous British admiral who distinguished himself in the naval battles of the seventeenth century that wrested the supremacy of the seas from the Dutch. During the civil war between Charles I and Parliament, in which he aided Cromwell, Blake destroyed the squadron of the Royalist general, Prince Rupert, and as a reward for his services, he was made sole admiral of the English fleet. Between 1652 and 1653, he won a series of victories over the Dutch Admiral Tromp, and forever ended Holland's claim to being mistress of the seas.

In 1654 Cromwell sent Blake to the Mediterranean, where he succeeded in upholding the dignity of the British flag, in contests with the Dutch, the Spanish, and the French. He attacked Tunis, the dey of which had insulted the British flag, routed an army of Turks, and at Algiers and Tripoli set free all the English held there as slaves.

Related Subjects. The reader is referred in these volumes to the following articles.

Charles (I, England)
Cromwell, Oliver

Netherlands (History)
Tromp, Martin

BLAKE, WILLIAM (1757-1827), an English engraver and poet who occupies a unique place among English poets by reason of the unusual character of his writings.

His poetry, which he himself illustrated with drawings of great beauty and originality, has the imaginative quality of Spenser's work, the spirit and ring of the Elizabethan lyrics, and many elements of the writings of the Romantic poets who followed him. He shows his love of children and animals, and an appreciation of the beauty that lies in ordinary life. His best-known poems are found under the titles *Songs of Innocence* and *Songs of Experience*.

Charles Lamb regarded him as one of the most extraordinary men of his age, and Swinburne characterized him as "the single Englishman of supreme and simple poetic genius of his time."

BLANC, MONT. See MONT BLANC.

BLANC-MANGE, *blah-manzh'*, a popular dessert having the appearance of jelly. It is whitish in color, and is made of Irish moss, cornstarch, arrowroot, or other starchy substances, boiled with milk and flavored. Frequently, chocolate and various fruit juices are added. Served with cream or sauce, blanc-mange is a wholesome and agreeable dessert, pleasing both to the eye and taste. E.V.M'C.

Derivation. The name comes from the French *blanc*, meaning *white*, and *manger*, meaning *to eat*.

BLAND, RICHARD PARKS (1835-1890), for many years the leader of free-coinage sentiment in the national House of Representatives and co-author of the Bland-Allison silver bill of 1878, which was passed over President Hayes' veto. He was born near Hartford, Ky., and after wandering as far west as California, finally returned to Missouri to practice law. He was elected to the lower house of Congress in 1872, where he served until his death, with the exception of the years between 1895 and 1897.

Bland was a prominent candidate for President at the Democratic convention in Chicago in 1896, but he withdrew in favor of William Jennings Bryan, who was nominated because of a brilliant appeal on the silver issue, known as the "cross of gold" speech.

The Bland-Allison Bill, through which his name became famous, provided for the purchase by the government of not less than \$2,000,000 nor more than \$4,000,000 worth of silver bullion a month. This



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WILLIAM BLAKE

bill was in effect until repealed by the passage of the Sherman Law, in 1890. See HAYES, RUTHERFORD B. (Financial Legislation); ALLISON, WILLIAM B.

BLANK VERSE, a form of poetry employed in some of the noblest poems ever written. The name *blank* refers to the lack of rhyme at the ends of lines. The first English poet to employ blank verse was Henry Howard, Earl



Photo U & U

BLARNEY CASTLE

The stone on the highest point of the corner in center of picture is the Blarney Stone. It is held in place by two iron bars.

of Surrey, who in the sixteenth century translated into unrhymed verse two books of Vergil's *Aeneid*. Marlowe and Shakespeare brought this form of verse to perfection, and since their time it has been used by practically all the English poetic dramatists except Dryden, and by Milton, Tennyson, Browning, Wordsworth, and other writers, in many different forms of poetry.

A familiar example of blank verse is Bryant's *Thanatopsis*, in which is used the typical blank-verse line—a ten-syllable line having five feet of two syllables each, the second of which is accented. Such a line is an example of iambic pentameter, and is divided and accented thus:

To him' | who in' | the love' | of na' | ture holds' |

The concluding stanza of *Thanatopsis* very well illustrates the effects produced by blank verse, which critics agree is admirably adapted to use in poems that combine harmony of sound and dignity of music with nobility of thought:

So live, that when thy summons comes to join
The innumerable caravan, that moves

To that mysterious realm where each shall take
His chamber in the silent halls of death,
Thou go not, like the quarry slave at night,
Scourged to his dungeon, but, sustained and soothed
By an unfaltering trust, approach thy grave
Like one who wraps the drapery of his couch
About him, and lies down to pleasant dreams.

BLARNEY STONE. In a small Irish village five miles from Cork stands the famous Blarney Castle, whose wall retains the stone much kissed because of the superstitious belief that it will give to those who kiss it the power of the "sweet, persuasive, wheedling eloquence" so perceptible in the language of the Cork people. To kiss this stone one must kneel and lean out beyond the edge of the wall, for the original stone, which once bore the date 1446, is fastened to a buttress several feet below the top of the wall. Tourists from every part of the globe visit the castle just to kiss the stone. It is commonly believed that the Blarney Stone legend originated because the first owner of the castle delayed its surrender in medieval times by promises and flattering speech.

BLASHFIELD, EDWIN HOWLAND (1848-), an American artist whose wall paintings, which adorn some of the finest buildings in the United States, have brought him into the front rank of decorative painters. He was born in New York City. After studying in Paris under the famous French painter, Léon Bonnat, he spent several years in France, Italy, Greece, and Egypt, returning to the United States in 1881, when he began work as a figure painter. After 1892 he gave his time entirely to decorative painting. Blashfield's work is characterized by delicate and beautiful coloring. He is a member of the National Academy of Design.



Photo Brown Bros.

EDWIN BLASHFIELD

His Work. Of his early canvases, the best-known are *Christmas Bells* and *The Angel with the Flaming Sword*. His later achievements include the painting on the central dome of the Library of Congress, picturing the *Development of Civilization*; in the Baltimore courthouse, *Washington Resigning His Commission* and *Lord Baltimore's Edict of Toleration*; and the ceiling decoration of the great ballroom of the Waldorf-Astoria Hotel, New York, representing *Dance and Music*.

With his wife, Blashfield wrote *Italian Cities* and edited Vasari's *Lives of the Painters*.

BLASPHEMY, *blas' fe mie*, a term originally meaning *profanity*, but now applied to a spoken or written insult to the Deity. From

the earliest days, blasphemy has been an offense against man's laws, and once was punished severely, even by decree of death. In England, until 1547, blasphemous persons were whipped and imprisoned; until 1825 the legal punishment in Scotland was death, and by the present laws of that country the offense is punishable by imprisonment. In the United States and Canada, the punishment for blasphemy was formerly imprisonment and whipping, but, as in England, the law has fallen gradually into disuse, though it may be invoked on any suitable occasion. The Bible declares that at the final day there shall be a strict accounting for blasphemy.

BLAST FURNACE, the name given to the common smelting furnace, used for obtaining iron from its ores with the aid of a powerful blast of air. See IRON AND STEEL (The Blast Furnace).

BLASTING. When the Panama Canal was being constructed, immense quantities of dynamite were used to tear away the obstructing masses of rock and earth. At the blowing up of the Gamboa dike, at the northern end of the Culebra (now Gaillard) Cut, forty tons of the explosive were placed in a thousand holes, each containing about eighty pounds. At a given signal in October, 1913, President Wilson, in Washington, touched an electric button that completed a circuit connecting with the charge, more than 2,000 miles away. Instantly, a huge explosion tore down the dike and removed the last obstacle to the union of the waters on the east and the west.

Not all blasting operations are so dramatic as the one above described, but operations of like nature, on a smaller scale, are taking place all over the world all the time, and are annually moving billions of tons of obstruction, in the service of agriculture, mining, and engineering. While dynamite (which see), the "Aladdin's lamp of modern industry," is the most important kind of explosive used in blasting, other substances also are employed, as told elsewhere in these volumes under EXPLOSIVES.

In ordinary blasting operations, such as occur in railroad construction, excavations for buildings, and mining, holes are bored to the requisite depth by means of drills; the explosive is introduced, the hole is *tamped*, or filled up, with broken stone, clay, or sand, and the charge is exploded by means of a fuse or by electricity. In larger operations, mines or shafts of considerable diameter may take the place of the holes above described.

Long before the invention of gunpowder, the first explosive of which we have definite record, hard masses were broken up by means of tools and by the fire-and-cold method. According to Livy, Hannibal forced his way over the Alps by lighting fires against rocks and then dashing cold water over them. Cracking

from the effect of this alternation of heat and cold, the rocks could be moved or broken into smaller fragments by such tools as Hannibal had at his command. In some localities to-day, quarrying of rocks is accomplished by the aid of the alternate freezing and expansion of water in rock crevices.

BLASTOMYCOSIS, *blas to mi ko' sis*, a parasitic disease. See PARASITIC DISEASES.

BLAVATSKY, *bla vahts' ke*, HELENA PETROVNA HAHN-HAHN (1831-1891), a famous Russian spiritual leader, whose teachings embody the doctrines held by modern theosophists (see THEOSOPHY). During twenty years of travel in various parts of the world, she made a special study of the mystic factor in religion, and in 1858 became a famous spiritualistic leader in Russia. Later, she moved to the United States, where in 1875, in New York City, she founded the Theosophical Society. Four years afterward, a branch society was organized in Bombay, India. She is regarded by theosophists as their greatest leader; they have never faltered in their belief in her psychic powers. When she died, she had nearly 100,000 followers in England, France, the United States, and Canada. Her most important work, *The Secret Doctrine*, is a textbook of the theosophists.

BLEACHING, from the German *bleichen*, meaning *to whiten*, is the process of making cotton, linen, wool, silk, and other fabrics white by removing from them their natural coloring matters. Bleaching in its simplest form is practiced by the housewife who spreads her washing on the grass to whiten in the sunlight. This custom originated many centuries ago, the process of bleaching is supposed to have been known to the Egyptians, Babylonians, and Hebrews. The ancient method, which was in use until the eighteenth century, consisted in spreading the cloth on a stretch of grass, and leaving it exposed to the air and sunlight for several months, with sprinklings of water each day.

In the eighteenth century, the Dutch discovered a new method, and Holland became an important center of the bleaching industry. The Hollanders steeped the fabrics repeatedly in potash lye, soaked them in buttermilk for about a week, and then washed and spread them on the ground to whiten. They obtained such good results that the name *hollands*, still in use, was given the excellent fabrics bleached in this manner; also, a very desirable quality of linen, which was spread on plots of grass, came to be known as *lawn*. The Scotch and Irish still bleach their fabrics by spreading them on the grass, a process called *crofting*, from the Scotch word *croft*, meaning a small tract of meadow land.

Bleaching as carried on at the present time is a complicated process requiring the special machinery of the modern factory. It consists

of steepings, boilings, washings, and dryings, and the use of various chemicals, particularly the bleaching powder called chloride of lime. The operations vary according to the materials of which the fabric is composed, and according to the fineness or coarseness of the yarn. Cotton bleaches more quickly than linen, and requires fewer operations, for the latter must be subjected first to a series of alkaline boilings to dissolve the impurities that are present in the flax fiber. Linen fabrics are often exposed to the action of air, light, and moisture for several days, as this is supposed to make the fiber retain its strength and thus add to the life of the cloth. This step of the process is called *grassing*.

Wool and silk goods in the process of bleaching are subjected to the fumes of burning sulphur; the sulphur combines with the coloring matters in these fabrics to form a colorless compound. The original coloring matter is not destroyed, however, and it reappears, giving the material a yellowish tint if it is washed several times with soap containing potash. Hydrogen peroxide is coming into general use as a bleaching agent for silk.

Straw, beeswax, feathers, hair, ivory, oils, sponges, and the rags and paper used in paper-making are also bleached. B.M.W.

BLEB. See FIRST AID TO THE INJURED

BLEEDER. See BLEEDING.

BLEEDING, or HEMORRHAGE, *hem' o-rajé*, is an escape of blood from an internal vessel either into a body cavity or to the outside. Bleeding into an internal body cavity, such as the lungs or stomach, is called internal bleeding. It may occur from an artery, vein, or capillary. However, capillary bleeding is usually termed *oozing*.

Bleeding is stopped by means of the coagulation of the blood, the process being called clot formation. The clot forms over the end of the bleeding vessels, binds the sides of the vessel wall together, and finally serves as a scaffold for the scar tissue which permanently plugs the severed vessel.

Bleeding from an artery is indicated when the blood issues in spurts and under considerable pressure. The spurts keep time with the pulse. This blood is bright red in color. Bleeding from a vein is suggested when the blood wells up, possibly under pressure, but does not spurt, and does not come with much force. This blood is apt to be darker red in color. Bleeding from capillaries takes the form of an oozing; the blood fills up the wound and overflows.

First Aid. *Arterial Bleeding.* If the bleeding is from a limb, throw a tourniquet around at a point toward the heart from the wound. Pressure on the artery above the wound is effective, provided the vessel can be pressed against from above. If no other method is available, put

the thumb in the wound, locate the bleeding vessel, and press until spurting stops. However and wherever the pressure is applied, it must be continued long enough for clots to form, and for tissues to become glued together. Then the pressure must be slowly and cautiously released. If a tourniquet is kept on more than a half hour to one hour, the parts beyond may die from lack of blood supply. It is safest to tie the cut artery.

Venous Bleeding. Apply pressure in the wound or at its edge, particularly the edge away from the heart. The pressure should be released slowly and carefully.

Capillary Bleeding. Slight pressure in or near the wound may be necessary, though as a rule, non-interference is the better policy. Bleeding wounds should not be washed until the clots have had time to form and become firmly attached. Foreign bodies, such as cotton or gauze, placed in a wound promote clotting, and thereby tend to stop bleeding.

Nosebleed. See FIRST AID TO THE INJURED.

Bleeders. There is a condition known as *hemophilia*, and those subject to it are known as bleeders. Hemophilia is an inherited condition which affects males only, but is transmitted by the female alone. The blood of a bleeder is almost without power to clot. Therefore, a simple oozing, as from the pulling of a tooth, may be fatal in a bleeder. The coagulation or clotting of blood is increased by injecting horse serum or some preparation of lime. See FIRST AID TO THE INJURED. W.A.E.



BLEEDING HEART

BLEEDING HEART, a hardy, late-spring flower, rich in home associations and in memories of old-fashioned gardens. The flowers are irregularly heart-shaped, deep rosy red, with

the inner petals white. The structure of stem and flower is so delicate that it seems as though the little rosy blossoms are dripping toward the ground. With its wealth of fresh foliage and interesting flowers, the bleeding heart makes an attractive border.

This plant was brought from Japan and introduced into England, about 1850, after which it spread to all home gardens and is now a favorite everywhere. It is easily cultivated, and if lifted in the fall and potted, will grow very successfully with gentle heat. B.M.D.

Scientific Name. The bleeding heart belongs to the poppy family, *Papaveraceae*. Its botanical name is *Dicentra spectabilis*.

BLenheim, blen' im, BATTLE OF, a celebrated battle of the War of the Spanish Succession, fought on August 13, 1704. In this battle, the allied forces of England and Austria, under the Duke of Marlborough and Prince Eugene, gained a decisive victory over the French and Bavarians.

In Robert Southey's poem, *The Battle of Blenheim*, three stanzas of which are here given, an old man is supposed to be telling his two grandchildren the story of the battle:

"They say it was a shocking sight,
After the field was won,
For many thousand bodies here
Lay rotting in the sun;
But things like that, you know, must be,
After a famous victory.

"Great praise the Duke of Marlbro' won,
And our good Prince Eugene "

"Why, 'twas a very wicked thing!"

Said little Wilhelmine.

"Nay, nay, my little girl," quoth he,

"It was a famous victory.

"And everybody praised the Duke,

Who such a fight did win "

"But what good came of it, at last?"

Quoth little Peterkin.

"Why, that I cannot tell," said he,

"But 'twas a famous victory "

Blenheim, the village from which the battle took its name, is situated in Bavaria, on the Danube, about twenty-three miles northwest of Augsburg. Its chief interest is historical, as the population is less than 1,000. See FIFTEEN DECISIVE BATTLES.

BLANNERHASSETT, blen' ur has set, HARMAN (1764-1831), an English emigrant to the United States who gave aid and encouragement to Aaron Burr (which see) in the latter's plan to establish an empire in the Southwest.

He was born in Hampshire, England, and was educated in London and Dublin. In 1797 he emigrated to America, and settled on an island in the Ohio River below the present city of Parkersburg, W. Va. It was there that Aaron Burr visited him and persuaded him to become a fellow-conspirator. When the plan

failed, Blennerhassett was arrested on the charge of treason. Though not convicted of this crime, he lost the greater part of an ample fortune. He died on the island of Guernsey.

'BLES'BOK, an antelope common to Southern Africa, known more commonly by the name *hartebeest*. See HARTEBEEST.

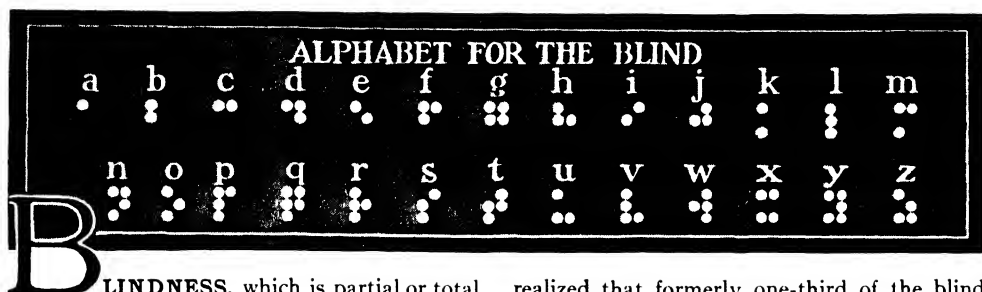
BLIGH, bli, WILLIAM (1754-1817), an admiral of England, known to fame principally for the part he played in the *Bounty* mutiny. He was an underofficer under Captain James Cook on the latter's second trip around the world. On this voyage the breadfruit tree was discovered, and he was ordered (1787) to command the *Bounty* and carry breadfruit trees to the West Indies for propagation. On this trip, a part of the crew mutinied and forced the captain and nearly twenty men into a boat in which they were cast off. The victims drifted 3,600 miles and landed on Timor Island, after three months of incredible hardship. When Bligh finally reached England, a warship was dispatched to capture the mutineers. Some were seized; the remainder had escaped to Pitcairn Island (which see).

BLIGHT, blite, a term commonly applied to the effects of disease upon plants, and also to a few special plant diseases. For example, when leaves, fruits, stems, and other parts wither and die because of infection, the symptoms are often described as a blight of the organs involved. Among the specific plant diseases to which the name is applied are *blossom blight* of cherries, *leaf blight* of cotton, and *cane blight* of blackberries. These are all caused by fungi. Other blights are the result of bacterial infection. *Fire blight* of the pear and apple and *bean blight* are among the most serious of this class. B.M.D.

Related Subjects. For more detailed information in connection with the subject, the reader is referred in these volumes to the following articles:

Bacteria and Bacteriology	Plant
Disease (Diseases of Plants)	Rusts
Insecticides and Fungicides	Smuts

BLINDFISH, the name given to several kinds of fish inhabiting the waters of caves. Those in Mammoth Cave, Kentucky, especially, are objects of curiosity to tourists. Places for the eyes are indicated on the head, but the fish have no organs resembling eyes. The head and body, however, are covered with rows of small projecting bodies, or papillae, that are very sensitive to the touch. These fish never exceed five inches in length; the body is colorless, and when held between the eye and a light, shows the light through it dimly. Scientists have never definitely settled the question whether or not these fish formerly had eyes, but the general supposition is that the eyes were lost while the fish were living for generations in waters from which light was excluded. See MAMMOTH CAVE; ATROPHY. L.H.



B LINDNESS, which is partial or total loss of the sense of sight, may be due to a wide variety of causes. In some cases, it is brought about by imperfect development of the visual apparatus or by defects in certain parts of the delicate mechanism of the eye. Such cases are said to be examples of *congenital* blindness. *Acquired* blindness is caused principally by accidents, operations, various eye diseases, certain diseases of the body, poor lighting, protracted eyestrain, and misuse of certain poisons, notably wood alcohol.

Common Eye Diseases. *Conjunctivitis*, which is inflammation of the mucous membrane that covers the inner part of the lids and the exposed part of the eyeball, is an infectious disease that is very often transmitted by that relic of barbarism, the public towel. Attacks of this malady, if not promptly treated, are liable to result in a chronic form of the disease, in which the membrane becomes thickened and reddened. Victims of chronic conjunctivitis suffer from heaviness of the lids and eye fatigue, and they experience great discomfort in bright light. Acute and chronic forms of the disease should have the attention of a competent oculist until they are cured.

Trachoma, or granulated lids, is another infection of the conjunctiva, but of a more serious character. Infection in a single family is easily transmitted by the common use of towels, wash basins, etc., and the utmost precaution should be taken to prevent the spread of the disease. Children should not even be allowed to play with toys that have been handled by victims. Trachoma is responsible for so large a number of cases of blindness, and is known to be so serious an ailment that the United States government prohibits immigrants suffering from it from entering the country. The disease tends to produce inflammation in the interior of the eye, ulcerations of the cornea, and deformities of the lid. It usually requires several months of medical treatment to cure an attack of trachoma.

Ophthalmia neonatorum, infection of the conjunctiva of newborn infants, is a terrible disease that usually makes its appearance on the second or third day after birth. It produces blindness by causing ulceration of the cornea. Characteristic symptoms are badly swollen lids and profuse discharge of pus. When it is

realized that formerly one-third of the blindness in children was due to this disease, one is not surprised to learn that societies have been formed for the prevention of infant blindness. If a newborn baby's eyes show the slightest signs of inflammation, the present-day nurse or doctor cleanses the lids thoroughly with pure cotton and water, and then drops into each eye a solution of silver nitrate, specially prepared by health departments as a prophylaxis. In some localities, the law requires the free distribution of silver nitrate to doctors.

Iritis is an inflammation of the iris and of the muscular body which controls the shape of the lens (the ciliary body). It is either the result of disease elsewhere in the body or of infection which has entered the body through some other channel than the eye. Rheumatism and syphilis are common causes; a form known as *traumatic iritis* is the result of injury to the eye. Symptoms include pain in the eye, over the forehead, or in the temple; contraction of the pupil; sensitiveness to light; and redness of the eyeball. Neglect of this serious disease may cause shrinkage of the eyeball and complete loss of sight, but proper treatment taken in time usually effects a cure. In case of injury to one eye, precautions should be taken to keep the infection from the uninjured organ.

One of the most serious features of traumatic iritis is the tendency of the uninjured eye to become diseased through what oculists call "sympathy." Often the undelayed removal of the injured eye is the only means of preventing total blindness in both eyes. This drastic treatment is determined by the location and extent of the injury.

Glaucoma, or hardening of the eyeball, results from an interference with the drainage of the fluids from the eyeball. Only a competent physician can correctly diagnose this ailment when it is inflammatory in character, for then its symptoms are like those of iritis. No one should attempt to prescribe his own treatment, or to take drugs without advice. Belladonna, which is helpful in iritis, would cause blindness if used as a remedy for glaucoma.

Cataract is caused by opacity of the crystalline lens, through which the light and its shadows must pass in order to reach the optic nerve and be telegraphed to the brain. There are three types of cataract: senile, congenital,

and traumatic. The usual remedy is removal of the crystalline lenses, and as a substitute the wearing of heavy magnifying glasses.

Other grave eye disorders are *retinitis*, or inflammation of the retina, *atrophy of the optic nerve*, and tobacco and alcohol *amblyopia*. The latter, which is inflammation of the optic nerve between the eyeball and the brain, is the result of chronic poisoning from the use of tobacco or alcoholic beverages. The victim at first complains of a cloud before his eyes, which always appears in the direction in which he is looking. Interference with the ability to distinguish between colors is another early symptom. Abstinence from liquor and narcotics is absolutely essential to effect a cure.

There are many cases of defective vision, due to nearsightedness, astigmatism, etc., which can be corrected by the right kind of glasses. Any evidence of eye trouble, whatever its nature should be diagnosed without delay. Educational authorities are coming more and more to realize the dangers that result from neglect of the eyes; it is customary in many towns and cities to have systematic physical examination of pupils by reliable physicians. Such precautions have been the means of saving or conserving the sight of many children. Blindness is decreasing in all enlightened countries.

Accidents. Eye injuries in industrial plants occur in largest numbers among workmen in the iron and steel industries. Small slivers of

steel, struck off from large pieces under the blow of the hammer, are a fruitful source of trouble. If these tiny particles fly into the eye and are left there, they may cause serious trouble, even loss of sight. Workmen thus injured should have the particle located by means of the X-ray, and see that it is immediately extracted. In many cases these tiny pieces of metal can be drawn out with a magnet. Those who have made a study of the subject believe that the wearing of protective glasses should be made obligatory upon all workmen who are exposed to injuries of this nature.

In blasting operations, the premature explosion of charges is a common cause of injury to the eye. Such accidents result from too short fuses, or from delay in explosions. In the latter case, the workman goes to the charge to find the source of the trouble, and the blast meets him in the face. Similar accidents occur in hunting and in Fourth of July celebrations, though the latter are each year becoming more infrequent. Forethought and ordinary care will prevent nearly all disasters of this nature.

Everyone is liable to eye injuries from dust particles in the air, from cinders, etc. The great lesson for all is not to neglect the organ that gives the priceless possession of sight. Here, as in so many cases, "an ounce of prevention is worth a pound of cure." Prompt measures of relief should be the rule, whether the eye is attacked by disease or is injured. E.E.A.

Education of the Blind

Sad as the condition of the blind is to-day, it is happiness itself when compared with that prevailing a century and a half ago. Up to that time, almost no attempt had been made to educate the blind. It was assumed that they must go through life dependent, unoccupied, and restless; while they may have resented the fact of their blindness, there appeared to be no way to fight against its consequences.

Beginning of Movement for Education. But all people could not be content thus to take for granted the misfortune of the blind. In 1646 an Italian writer published a book which argued the question of doing something for them. This book led to nothing immediately practical, and to no really systematic attempt to give instruction, but in 1784 a Frenchman, Valentin Haüy, opened in Paris the first school for blind youth. He invented books with raised letters, which could be read by the sense of touch; for investigations had long before revealed the fact that this sense was likely to be highly developed in the blind.

The school movement spread rapidly over Europe during the early years of the nineteenth century; now practically every country has its schools for the blind; nearly all of them are residential. In most of them, the chief

activity continued for a long time to be manual and industrial.

Growth in the United States. The United States schools have from the first been on a somewhat different basis from those of Europe; they form a part of the regular educational system provided by the states, though the instruction is given in special residential schools. Thus, young blind people look upon themselves not as a class apart, but as simply one division of the great school-going public. Some authorities believe that, whenever possible, the blind should be taught in classes with those who can see; that it is advantageous both to the blind and the other children to be brought together at an early age. Accordingly, several cities conduct day-school classes for their blind children.

Education has been for the most part along three lines: *literary*, including the branches taught in most grammar and secondary schools, and some not commonly taught there, such as typewriting and simple business; *musical*, including voice training and instruction on the piano or other instrument, with special training toward composition or teaching, if the talent of the pupil seems to warrant this; and *industrial*, beginning with general manual train-

ing and including training in those occupations in which the blind most often successfully engage, such as cane-seating, broom-making, basket-making, knitting, crocheting, housework, carpet-weaving, and piano-tuning. Since the sense of hearing is likely to be unusually discriminating in the blind, many of the men become expert in this last calling; for years the pianos in the public schools of Boston have been kept in tune by graduates of the Perkins Institution, a school for the blind.

This institution was incorporated in 1820, and was opened in Boston in 1832. From the start, it received help from Massachusetts; and the other New England states took advantage of the opportunities it offered by sending their blind to it at state expense, as they continue to do. In honor of a generous benefactor, the institution was renamed Perkins Institution, and later added to its title the phrase Massachusetts School for the Blind. Under the direction of Dr. Samuel G. Howe it rapidly attained the high rank which it still holds. The exhibitions which its pupils gave before various state legislatures led to the founding of like institutions in many parts of the country. The institutions at Boston, New York, and Philadelphia, beginning nearly together, are called the pioneer schools. While these have continued under private control, nearly all the others are state schools.

A very special triumph for Dr. Howe and Perkins Institution was the education of Laura Bridgman, a blind deaf-mute who was brought to the school in 1837, at the age of seven. Despite very general predictions of failure, Dr. Howe and his assistants succeeded in opening up the world to the child, hitherto so entirely shut in, and in making of her a busy, useful woman. Authorities all over the world took an intense interest in her and in succeeding cases of the kind.

A comparatively new development, beginning in Philadelphia, has been the attempt to teach the adult blind at home. In several states "home teachers" are provided at government expense, who give instruction not only in reading, but also in certain of the crafts. All of the institutions gladly grant the use of their embossed books to the adult blind. What is needed is the creation of additional state commissions to deal with the problems of the adults who have lost their sight when over school age; for about three-fourths of the blind population is adult.

Books and Apparatus. Naturally, oral reading by the teachers is made use of more in institutions for the blind than in ordinary schools, but much must be done through the sense of touch, and special books and apparatus are therefore necessary. The first attempts at teaching the blind to read were made by means of raised letters, in form similar to the ordinary

letters of the alphabet, which from one-third to one-half of the pupils learned to recognize by running their fingers over them.

The effort to improve this means, to the end that every pupil might be able really to read, led to the devising of various arbitrary systems, of which the surviving one is the *braille*, whose alphabet heads this article. Braille takes as its basis six points, or dots, arranged in two vertical, parallel columns, and shifts them into different combinations to represent the letters. Those who advocated the first, or Roman-letter, system based their arguments on the conviction that the education of the blind should be as nearly as possible like that of people with good eyesight, and that everything which tends to make differences between the two widened this gap between them.

The chief advantage of braille is that it enables the blind to write as well as to read. By means of a pitted board, a perforated metal rule, and a stiletto, any blind person may indeed learn to write, with a fair degree of rapidity, notes in words, figures, or music, the writing being done forward, from right to left; the paper is reversed for reading. With its adoption, modern schooling of the blind became possible.

Geography is usually taught by the aid of relief maps, in which the towns are indicated by metallic points, the boundaries by raised lines, and the mountains, valleys, and rivers in the ordinary manner of relief maps. Dissected maps, cut along state and county boundary lines, such as those which are given to children as puzzles, are a help in teaching outlines. Some resourceful teachers get their pupils to build up maps with plasticine or paper pulp, and to draw their own geometrical diagrams so that they are tangible.

Natural history is taught by the use of models and mounted specimens of animals and birds; models of papier-mâché also help in the study of anatomy. The models used in teaching botany must sometimes be much more than life-size, that the different parts may be perceived by touch.

In nearly every residential school, a kindergarten has been established. The department is very successful, since all those occupations which do not call for blending of colors or for drawing may be taught. Froebel's *gifts* (see KINDERGARTEN), in use in all kindergarten work, require but little adaptation for use with blind children.

At Louisville, Ky., is the American Printing House for the Blind, a nationally supported institution. In connection with some of the schools, there are embossing departments which put out books and music, and thousands of volumes, both of school textbooks and of the choicest works, are now available in braille. The schools, all of which have libraries, are

generally anxious to loan these to any blind person; and the United States Postoffice Department carries them free.

There are in the United States more than twenty circulating libraries from which embossed books are sent out; the number of volumes reported as circulated is over 300,000. Several monthly and one weekly magazine in braille are now published and circulated. *The Outlook for the Blind*, the organ of communication in ordinary letter press, appears quarterly.

The modern English practice is that of sending to special day centers in the public schools of their home cities those children whose eyesight will permit them to read coarse black type; this practice began in the United States in 1913. Because of it and of the growing successes in preventing blindness among children, the number of pupils in schools for the blind is happily diminishing.

Following the European custom, special handicraft shops have sprung up, but these are chiefly for the employment of men who have lost eyesight after school age. The school-trained blind have rather laudably managed to follow more or less independent pursuits at home or in the world. During or immediately after the World War, these opportunities increased.

E.E.A.

Related Subjects. Those interested in this subject will find the following articles helpful:

Astigmatism	Eye (Care of the Eye)
Bridgman, Laura	Keller, Helen A
Cataract	

BLINDWORM, a name applied to certain reptiles and amphibians because they have very small eyes, though none of these is actually blind. The common European blindworm, also called *slowworm*, is a legless lizard with an elongated tail and body that give it the appearance of a snake about a foot long. It possesses movable eyelids, however, and other lizard-like features. Like similar American species, including the so-called *glass snake* (which see), it escapes from pursuers by parting with its tail, which becomes stiff and brittle when the animal is seized from behind. The blindworm is a harmless burrowing creature; it feeds on slugs and insects.

The name *blindworm* is also applied to certain wormlike amphibians found in warm parts of the world, particularly in South America. They live in underground burrows, and feed on worms and insects. Some of them have the eyes covered with skin. These are all degenerate species of amphibians, and are neither lizards nor serpents. See AMPHIBIANS. L.H.

Scientific Names. The European blindworm is classed as *Anguis fragilis*, of the family *Anguidae*. The amphibians called blindworm constitute the family *Caeciliidae*.

BLISS, TASKER HOWARD (1853-), an American army officer of varied experience, was born at Lewisburg, Pa. In his youth he received appointment as a cadet at West Point, from which he was graduated in 1875. He served three years as professor of military science in the Naval War College, and in 1888 went to Spain as military attaché of the American legation. During the Spanish-American War, he served in the Porto Rican campaign, and at its close became collector of customs at the port of Havana for the period of the American occupation.

By this time he had risen to the rank of brigadier general. Upon release from Havana, he became a member of the Army War College Board, then commandant of the Army War College. In 1903 he was sent to the Philippine Islands as a department commander. When he returned home, in 1909, he became president of the Army War College and assistant chief of staff of the army. During the early part of the Mexican uprising, he commanded a brigade, and in 1915 returned to Washington as assistant chief of staff, in 1917 becoming chief. In November, 1915, he was raised to the rank of major general. Bliss was in Europe in 1917, ranking as general, as American representative on the allied war board, and later was in the American delegation at the Peace Conference See VERSAILLES, TREATY OF.

BLIZZARD, a severe winter storm characterized by violent, cold wind filled with snow and tiny particles of ice. These storms, known by different names in different northern countries, are caused in the great polar regions by high barometric pressure forcing out currents of cold air. They are usually preceded by a short period of warm weather, and Weather Bureau officials are able to forecast their course with great accuracy. They are common in Central and Eastern Canada, in the northern part of the Mississippi basin in the United States, and in Russia and Siberia. Because of the cold, exhausting wind and blinding snow, human beings and livestock frequently lose their lives in these storms. Numerous instances are recorded of people being lost and frozen to death while trying to find their way from house to barn in a blizzard.

BLOCKADE, *block ade'*, the patrolling by warships of coasts belonging to an enemy, to prevent the passage of forbidden vessels. To keep all vessels away from an enemy's country and thus to cripple the foe by shutting out arms, munitions, and even food, is held to be a legitimate act in warfare.

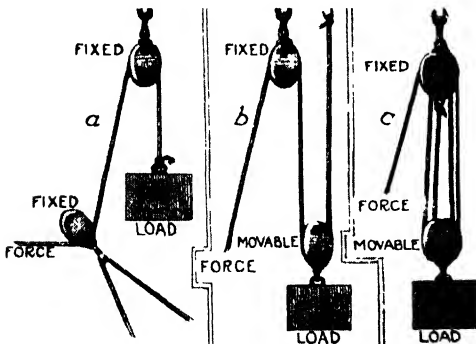
It is the theory of international law that notice must be given of any blockade, that neutral vessels within the blockaded district must be given a reasonable time to leave, that ships attempting to run the blockade (pass through it) may be captured, and that

their cargoes are also liable to seizure, unless the owners prove themselves not responsible for the attempt.

Paper Blockade. In 1806 Napoleon declared a blockade against the British Isles (see CONTINENTAL SYSTEM), and England retaliated by a similar measure against France. Neither country had sufficient ships really to enforce such extensive blockades. They existed only on paper, and the proclamations became merely excuses for capturing ships—a mild form of piracy. A “paper blockade” has therefore come to be known as a blockade declared only by publication, or merely a warning to neutral vessels to remain away from a forbidden zone. After the Crimean War, the representatives of the powers, in a meeting in Paris, declared that “a blockade to be binding must be effective,” that is, the blockaders must be able to endanger all ships that may attempt to pass. The German submarine blockade of the British Isles in the World War was considered a “paper blockade” by other countries.

Pacific Blockade. Since 1814 there have been a number of instances when one country has exerted force against another without resorting to war, by means of a pacific, or peaceful, blockade, to secure redress of grievances. Such a measure cannot be enforced against neutral vessels, but only against those of the nation blockaded, ships cannot be confiscated, but may be held until the conclusion of the blockade.

BLOCK AND TACKLE, a mechanical appliance which consists of a combination of pulleys and ropes. It is a machine, for it is



BLOCK AND TACKLE

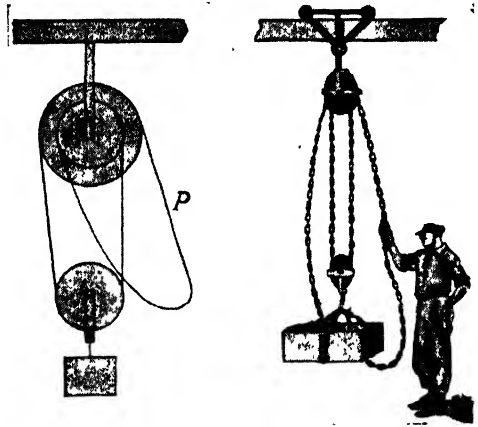
Fig. 1. (a) No mechanical advantage, (b) mechanical advantage of two; (c) mechanical advantage of four.

designed to perform work. *Block* refers to the casing for the pulleys; *tackle*, to the ropes. A single block contains one pulley; a double block, two pulleys, and so on. Each block usually has a hook with which to fasten it to its support or to the object to be moved.

In the article PULLEY, it is shown that a simple movable pulley, such as is contained in a single block and tackle, has a *mechanical advantage of two*; that is, with its help, a force will move practically two times the weight that it can move without it. The mechanical ad-

vantage of a double movable block is *four*, for, as shown in Fig. 1 c, there are four ropes, each of which bears one-fourth the weight; therefore, any pull on the end in excess of one-fourth the weight will lift the object. Similarly, the advantage of a triple movable block is *six*. It should be noted, however, that while the weight that can be lifted increases with the number of ropes, the distance through which the weight moves decreases in the same ratio.

Endless Chain. The apparatus shown in Fig. 2 is technically known as a differential pulley. It can be made to possess a very large



BLOCK AND TACKLE

Fig. 2. The endless chain

mechanical advantage. The lower block is single, but the upper block has two pulleys of different sizes, fastened so that neither one can turn without the other. When the chain is pulled at *p*, it is wound on the larger pulley faster than it unwinds from the smaller. If the circumference of the larger pulley is thirty-six inches and that of the smaller is thirty-two inches, when the wheels have been turned once the weight will have been raised the difference, or four inches. Meanwhile, the hand pulling at the rope moves thirty-six inches, nine times as far, and has exerted a force only one-ninth that of the weight. The mechanical advantage in this case is thus seen to be *nine*, but it increases as the difference in the size of the pulleys decreases.

A.L.F.

Application. The principles stated in the paragraph above can be reduced to definite formulas. Let *R* be the radius of the larger wheel in the differential pulley, and *r* represent that of the smaller. The circumference of the larger wheel is $2\pi R$, and that of the smaller, $2\pi r$, π (pi) being equal to 3.1416 (see explanation in the article CIRCLE). Let *W* represent the weight raised by *p*.

Since *R* is the radius of the large pulley, then the work done by *P* will be $p \times 2\pi R$. Since *r* is the radius of the small pulley, then the length of chain unwound in one revolution will be $2\pi r$. Therefore,

W' will be raised $1/2 (2\pi R - 2\pi r)$, or $(R-r)$, and the work done will be $W' \times (R-r)$.

Therefore, friction being disregarded, $W' \times \pi (R-r) = p \times 2\pi R$, and $\frac{W'}{p} = \frac{2\pi R}{\pi (R-r)}$

$$\text{Whence, } \frac{W'}{p} = \frac{2R}{R-r}$$

A workman wishes to lift an object weighing 1 ton by means of a differential pulley. The radii of the large and small wheels are, respectively, 10 inches and 8 inches. How much force must he exert?

SOLUTION

$$\text{Since } \frac{W'}{p} = \frac{2R}{R-r}, \quad \frac{W'}{p} = \frac{2 \times 10}{10-8} = \frac{20}{2} = 10$$

$$\text{Since } W' = 2,000, \quad \frac{2,000}{p} = 10, \text{ and } 10p = 2,000$$

Therefore p , or force exerted, = 200 pounds.

BLOCKHOUSE, a military fortification, formerly erected on frontiers and in pioneer settlements, usually to serve as a place of last resort in case of attack by hostile forces. Such houses were generally built of heavy logs or blocks of hewn timber, banked with earth. They were fitted with loopholes for musketry at the sides and in overhanging floors of upper stories. Built in the form of a square or cross, they were made large enough for twenty-five to one hundred men. Such houses saved many lives in the early wars with Indians.



BLOCKHOUSE

Even later, in the Spanish-American and Boer wars, they were employed to good effect. Against modern artillery blockhouses are useless.

BLOCK SIGNALS. See RAILROAD (Railroad Operation).

BLOEMFONTEIN, *bloom' fon tane*, a Dutch word meaning *fountain of flowers*, is the name of the capital of Orange Free State in the Union of South Africa, situated 600 miles northeast of Cape Town. It is well located on a plateau 5,000 feet above sea level, and has a healthful climate. The place was founded in 1846.

The city is on the main line of the Cape-to-Cairo Railway, and is in direct communication with all the principal South African towns. In educational facilities, Bloemfontein is advanced; it has a university, the buildings of which are worth nearly \$1,000,000, and which is the leading school in the Union; there is also an agricultural college. In the South African War, Bloemfontein was occupied by Lord Roberts, without opposition. In 1910 the city was chosen as the capital of the province, which

at that time was incorporated into the Union of South Africa. Population, 40,000, almost equally divided between whites and blacks; the latter are chiefly of the Bechuana and Basuto tribes.

BLOK, PETRUS J. See NETHERLANDS, THE (Language and Culture).

BLONDEL, *bloN del'*, a French minstrel who figures in a romantic tale of the twelfth century. He was the trusted attendant of Richard the Lion-hearted, king of England, as well as his instructor in music. During Richard's journey homeward from the Crusades, he was captured by the Duke of Austria and confined in a castle on the Danube. Blondel, so the story goes, wandered all through Germany in search of his royal master. Hearing that a distinguished captive lay within the Castle of Dürrenstein, he stood before that fortress and began to sing a song which he and the king had written together. Joyfully the minstrel heard the loved voice of his master take up the second stanza, and then he hastened home to England to secure the king's ransom. Blondel is mentioned in Sir Walter Scott's *Talisman*. See RICHARD (1, England); MINSTREL.

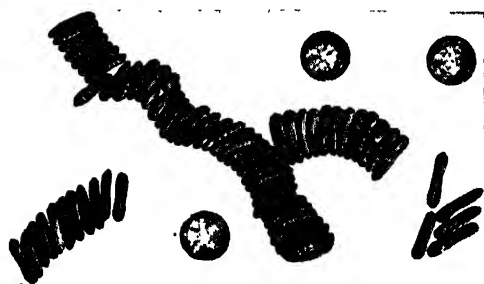
BLONDIN, *bloN duN'* (1824-1897), the assumed name of a famous French tight-rope walker, JEAN FRANÇOIS GRAVELET, whose remarkable feats in his dangerous profession included the crossing of Niagara Falls on a tight rope. After a successful career in France, he sailed to America with the Ravel family of acrobats, and while visiting Niagara conceived the idea of making the thrilling trip above the seething waters. Having bridged the distance with a rope 1,100 feet long and 160 feet above the water, he made the trip on August 17, 1850, in the presence of 50,000 spectators. Not only once, but many times, did he walk across; some trips were made blindfolded, and more than once he carried a man on his back over the roaring cataract.

BLOOD. Nature has provided for the distribution of dissolved food materials throughout the human body by a wonderful system of tubes, called arteries and veins, through which circulates a life-giving substance we call *blood*. This collection of tubes may be compared to the water-works system of a great city, by which the water is pumped into pipe lines and carried to the different homes, office buildings, and factories.

Functions of the Blood. That the blood is a tremendously important tissue (a fluid) is seen from its functions. It carries to the other tissues foodstuffs after they have been properly prepared by the digestive organs; it transports to the tissues oxygen absorbed from the air in the lungs; it carries away from the tissues waste products which have accumulated in their metabolism (which see); it is a medium for the transmission of the internal secretions

of certain glands; and finally, it aids in equalizing the temperature and water content of the body. Thus we see that it would be impossible for the body to survive without the aid of the blood.

Composition of the Blood. The blood is made up of two main parts—the liquid part, which is called the *plasma*, and the solid parts,



RED CORPUSCLES

Magnified about one thousand diameters

which are known as the *corpuscles*. Blood plasma is a faintly yellowish fluid, in which the corpuscles float. It is made up largely of water, but also contains other important elements, especially *fibrinogen*. This latter is a protein which has an important function in the clotting of the blood. All the food substances and internal secretions, and most of the waste products which the blood carries, are found in the plasma. The corpuscles are of three general types: the *red corpuscles*, which give the blood its red color; the *white corpuscles*, and the blood *platelets*. The red corpuscles are minute round bodies, only $1/3200$ of an inch in diameter. They are shaped very much like a coin, except that they are thinner in the center than at the edges. In a drop of blood the size of a pinhead, there are about 5,000,000 red cells. Contained in the red cells is a very important substance known as *hemoglobin*; it is a complex protein combined with iron, and has the power to bind oxygen to itself. It is by means of this power that the blood is able to carry oxygen from the lungs to the tissues. When hemoglobin is charged with oxygen, it is a bright red color, whereas when it loses its oxygen, it becomes almost blue in appearance. It is for this reason that arterial and venous blood have different colors. Arterial blood is filled with oxygen; venous blood comes from the tissues from which all the oxygen has been given off.

The white corpuscles are fewer in number than the red cells. There are about 7,000 in the small drop of blood that contains 5,000,000 red cells. They are, however, a good deal larger than the red cells, and some of them are capable of moving by their own locomotion. This is important, because probably the chief

function of the white cells is to go to the site of any infection and devour the invading bacteria, and also to clear away the waste which the bacteria have caused as a result of their destruction of tissue. This is why, when we have an infection, the number of white cells in our blood immediately increases. It is an attempt on the part of the body to provide an army which will destroy the invaders. Both the red and the white cells are formed in the red bone marrow. There are other types of white cells found in the blood which are not formed in the marrow, but they are much less numerous than those described.

The blood platelets are tiny rod-shaped bodies; they normally number about 250,000 in a small drop of blood. The chief function which they are known to possess is the aid they give to the clotting of the blood.

Clotting. You have often noticed that when you cut or prick your finger, blood flows freely for a short time and then gradually a thick, dark mass of blood forms over the injured area, and no further bleeding occurs. This thickening of the blood is known as *coagulation*, or *clotting*. It is easy to see what a tremendously important process it is, because if it did not occur, any break in the skin would allow the blood to flow out unchecked. *Hemophilia* is a disease of persons whose blood does not clot, and who are in danger of bleeding to death when the blood oozes from a cut.

Physiologists naturally have long been interested in this vital process, and have found it an extremely complex one which they still cannot explain in detail. They do know, however, that it is the fibrinogen in the plasma which, when exposed to air or when passed over the edges of a wound, forms tiny but very firm threads known as *fibrin*. These threads form a dense mesh, in which the corpuscles become entangled. This is the clot. The substance which stimulates the change from fibrinogen to fibrin is believed to be present in the blood platelets, and also in the damaged tissues which line the edges of any wound.

Blood of normal individuals clots quickly. As a precaution, before operation, the time of clotting of the patient's blood is always determined.

Quantity of Blood. The quantity of blood in the body is about one-thirteenth of the weight of the body. A man of average weight has from twelve to fifteen pounds of blood; allowing a pint to the pound, this amounts to



WHITE CORPUSCLES

Showing movements, similar to those of the amoeba (which see) (a) Beginning of movement, (b) formation of footlike projection, (c) nucleus changing form, (d) dead corpuscle.

about six quarts. As the normal quantity in any human body is almost perfectly proportioned to its needs, the loss of only a little through bleeding or disease induces weakness and dizziness. If the loss is not replaced by natural processes, serious results may follow (see ANAEMIA).

Circulation of the Blood. The various functions referred to in a preceding paragraph could not be carried on by the blood had there been no provision made for its circulation through the body. The arteries, veins, and capillaries form a complete system of pipe lines in the body, through which the blood is driven by the central pump—the heart. While all the vessels of this pipe line form one complete system, there is in reality a combination of three systems, each having a special purpose. One system carries the blood through the body, forming the body, or *systemic*, circulation; the second carries the blood through the lungs, forming the lung, or *pulmonary*, circulation; the third carries the blood through the liver, forming the liver, or *portal*, circulation. The last is properly a part of the systemic circulation.

Each system is double, that is, it consists of two sets of pipe lines—the *arteries*, which carry the blood *from* the heart, and the *veins*, which carry the blood *back to* the heart. In all the systems, the *capillaries* are the fine, hairlike pipes which connect the arteries and veins.

Wonders of the Circulation. It requires about thirty seconds for a drop of blood to make the rounds from the left ventricle of the heart and back to it, following the route outlined below, and it is estimated that all the blood in the body passes through the heart every two or three minutes. The best authorities estimate that 900 pounds, or 112 gallons, or nearly three barrels of blood, pass through each ventricle of the heart in one hour. Since the same amount passes through each, this would make six barrels of blood pumped by the ventricles every hour. The force expended by the heart in one hour would lift 11,250 pounds one foot; it would raise a man weighing 160 pounds seventy feet. The power of the heart, expressed in terms of mechanics, is about .0057 horse power.

Circulation Through the Body. The blood is forced by the contraction of the heart from the left ventricle into the aorta, or great artery; from this, main branches lead to the different parts of the body—the trunk, head, arms, and

legs. Each of these branches divides and subdivides until the arteries become capillaries, which form a complete network all through the body.

As the capillaries are formed by the branching of the arteries at one end, so at the other end they unite to form minute veins, which themselves unite into larger veins, until we find large veins side by side with the larger arteries; through these the blood is returned to the heart, where it enters the right auricle, through the *vena cava*. See HEART, for illustration of its parts; also color plate herewith.

Circulation Through the Lungs. The blood returned to the heart through the *vena cava* has given up much of its nutritive material and has taken the worn-out matter and carbon dioxide from the tissues. Moreover, the waste products absorbed by the lymphatics enter the blood in the *vena cava*, so that the stream returned to the heart is full of impurities, which account for its darker color. The circulation through the lungs, which has for its purpose the purification of the blood, begins at the right auricle, from which the blood passes to the right ventricle. By the contraction of the heart, the blood is forced from the right ventricle through the pulmonary arteries to the lungs, where it is distributed by the capillaries to the air cells. Here it gives up carbon dioxide and other impurities, and absorbs oxygen. It is then returned through the pulmonary veins to the left auricle, and again begins its journey through the body.

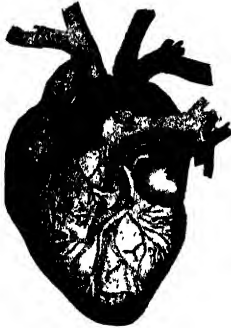
Circulation Through the Liver. The blood from the stomach, spleen, pancreas, and intestines is gathered up by the vein called the *portal vein* and carried to the liver. It passes through the capillaries of the liver and is then returned through the hepatic veins to the large veins leading to the heart. During its passage through the liver the blood stimulates the secretion of bile. In fact, some of the important constituents of the bile are believed to come from the red cells. As the blood passes through the liver, other important processes take place. Sugar is withdrawn in certain amounts from the plasma and stored in the liver as *glycogen*. Nitrogenous waste products are removed and transformed into the harmless substance *urea*. These are some of the important functions of the liver that make it indispensable to life.

Blood Poisoning, which is infection of the blood, is caused by the presence in the blood of germs, or their poisonous excretions. These organisms may enter the blood stream through cuts and bruises, boils, or any injuries that create an opening in the skin or mucous membranes. Even a scratch with an infected needle or piece of glass may cause blood poisoning that will terminate fatally. A nail wound or scratch on the foot will cause lockjaw if the nail is contaminated with tetanus germs, commonly found in soil (see LOCKJAW). In lock-



Highly magnified crystals of oxy-hemoglobin from human blood

CIRCULATION of the BLOOD



**External View
of the Heart**

1. Aorta
2. Pulmonary artery
3. Descending vena cava.
4. Right auricle
5. Left auricle
6. Right ventricle
7. Left ventricle
8. Left coronary artery
9. Left coronary vein

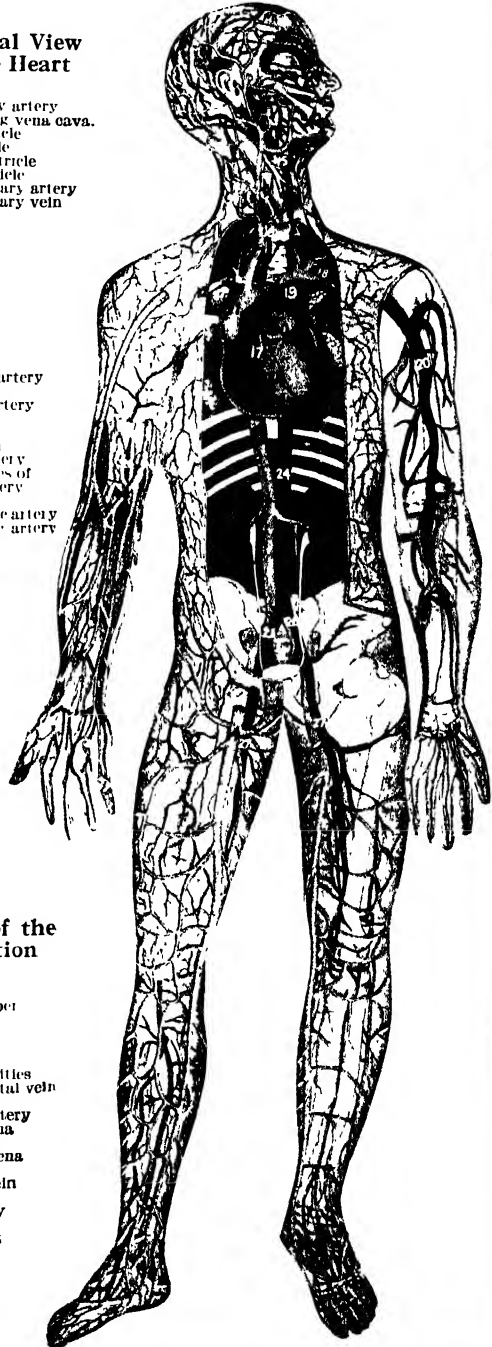
Veins and Arteries

- | | |
|------------------------------------|--|
| 1. Basille vein | 16. Common carotid artery |
| 2. Superficial radial vein | 17. Coronary artery |
| 3. Median cephalic vein | 18. Left subclavian artery |
| 4. Median basille vein | 19. Arch of aorta |
| 5. Anterior superficial ulnar vein | 20. Brachial artery |
| 6. Superficial median vein | 21. Deep palmar arch |
| 7. Right internal jugular vein | 22. Palmar digital artery |
| 8. Left internal jugular vein | 23. Collateral branches of palmar digital artery |
| 9. Right humerohumate vein | 24. Aorta |
| 10. Left subclavian vein | 25. Right common iliac artery |
| 11. Vena cava superior vein | 26. Left common iliac artery |
| 12. Right subclavian vein | 27. Femoral artery |
| 13. Ascending vena cava vein | 28. Pulmonary vein |
| 14. Common femoral vein | 29. Left pulmonary vein |
| 15. External carotid artery | 30. Right pulmonary vein |



Scheme of the Circulation

1. Heart
2. Lung
3. Head and upper extremities
4. Spleen
5. Intestine
6. Kidneys
7. Lower extremities
8. Liver and portal vein
9. Aorta
10. Pulmonary artery
11. Ascending vena cava
12. Descending vena cava
13. Pulmonary vein
14. Portal vein
15. Carotid artery
16. Lacteals
17. Thoracic duct



OUTLINE AND QUESTIONS ON CIRCULATION

Outline

I. The Blood

- (1) Composition
 - (a) Corpuscles
 - (b) Plasma
- (2) Amount
- (3) Temperature
- (4) Coagulation
- (5) Functions

II. Organs of Circulation

- (1) The heart
 - (a) Shape
 - (b) Size
 - (c) Position
 - (d) Structure
 1. Auricles
 2. Ventricles
 3. Valves
 4. Membranes
 5. Function
- (2) Arteries
 - (a) Structure
 - (b) Distribution
 - (c) Circulation in arteries
 - (d) Kind of blood carried
- (3) Veins
 - (a) Structure
 - (b) Distribution
 - (c) Circulation in veins
 - (d) Kind of blood carried

- (4) Capillaries
 - (a) Definition
 - (b) Close connection with arteries and veins
 - (c) Function

III. Circulatory Systems

- (1) Systemic or body circulation
 - (a) From the left ventricle
 - (b) Through the body
 - (c) Returned to right auricle
- (2) Pulmonary or lung circulation
 - (a) From the right ventricle
 - (b) Through the lungs
 - (c) To the left auricle
- (3) Portal or liver circulation
 - (a) Portal vein
 - (b) Hepatic veins

IV. Functions of Circulation

- (1) Nourishment
- (2) Purification
- (3) Elimination of waste
- (4) Heat
- (5) Part of work accomplished by each system
 - (a) Heart
 - (b) Arteries and veins
 - (c) Capillaries
 - (d) Lungs
 - (e) Liver

Questions

Name the different parts of the heart.

If the heart is a machine, why is it called the seat of affection?

How many barrels of blood does your heart pump between nine o'clock and three?

Into what part of the heart does the blood flow through the *vena cava*?

What is the difference in structure between veins and arteries? What is the difference in what they carry?

What is the blood doing as it flows through the arteries? What change is taking place in its appearance?

Why must the blood flow to the liver? How would the digestive processes suffer if the liver were unable to perform its work on the blood?

Name the three circulatory systems, and tell briefly the work of each.

How much do you weigh? How far would the force exerted by your heart in one hour lift you?

What do the lungs supply to the blood? What do they take from it?

How did Dr. William Harvey discover the principles of blood circulation?

How long does it take a drop of blood to make its circuit from the left ventricle, through the various systems, and back to its starting point?

How many times in twenty-four hours does all the blood in your body pass through your heart?

jaw, the symptoms are caused by toxins excreted by the germs and absorbed by the blood. Blood poisoning due to such toxins is called *toxemia*. When the germs themselves are in the blood, the condition is called *septicemia*. Formerly, many fatalities due to blood poisoning of the latter character followed surgical operations, and the surgeons themselves sometimes were infected. In modern hospital practice, the hands of the doctors and nurses, the body of the patient, and the instruments themselves are made sterile by washing and antiseptics, and cases of blood infection are the exception. (See WOUNDS, for directions for treating ordinary cuts and bruises.)

Diseases of the Blood. In addition to blood poisoning, in which toxic elements, entering from the exterior, use the blood as a vehicle of transmission to all parts of the body, there are certain diseases of the blood itself. In certain conditions, the number of red blood cells suddenly becomes greatly increased, so much so that the blood becomes very thick. This ailment is known as *polycythemia*. On the other hand, for some reason, the production of white cells may be greatly increased, giving the condition known as *leukaemia*. *Anaemia* is the condition in which the number of red cells is below the normal number. It may be due to several different causes. Malaria is a disease in which a germ enters from the outside and makes its home in the red blood cells.

Transfusion of Blood. This is an operation for the relief of those suffering from certain diseases or from the effects of hemorrhage. Transfusion is the injection into one person of blood taken from another. If the transference is from vein to vein, the operation is known as *direct*, or *immediate*, transfusion; if the blood is first freed from fibrin and injected from a receptacle, the operation is called *indirect* transfusion. The latter procedure is for the purpose of freeing the blood of clots. The addition of sodium citrate to the drawn blood prevents clotting, and permits it to be kept indefinitely in a fluid state. Some authorities prefer one method, some declare for another. The blood transferred must be compatible with that of the recipient, else the operation will fail and perhaps cause the death of the patient. Physicians recognize four types of blood. In some hospitals, lists of "donors" of blood, classified as to type, are kept on hand for emergency use. K.A.E.

Related Subjects. The article above cannot be fully understood without reference to some or all of the topics that follow:

Anaemia	Glands
Antitoxin	Harvey, William
Aorta	Heart
Arteries	Lacteals
Bile	Lockjaw
Bleeding	Lungs
Blood Pressure	Pulse
Capillaries	Veins

BLOOD, AVENGER OF. In most primitive societies, when a man was intentionally killed or seriously injured by another, his nearest relative felt it to be not only his right but his solemn duty to take vengeance. This next of kin was known as the *avenger of blood*. The act of vengeance, even if it went so far as murder, was not looked upon as a crime; failure to execute it brought disgrace not only upon the supposed avenger himself, but upon the dead as well. As society developed, these "blood feuds," as they were called, became subject to stricter regulation, and among many peoples cities of refuge were established, to which a manslayer might flee to be safe from the avenger until his case was investigated. The law of Moses appointed such cities, and the Greeks had them in abundance. Still later it was provided that the criminal might gain his safety by paying a fine known as *blood money*, which the avenger was compelled to accept.

The *vendetta* of Corsica and the *feud* of Kentucky, which play so large a part in the literature dealing with those sections, are but survivals of the old avenger-of-blood idea.

Related Subjects. The reader is referred in these volumes to the following articles

Cities of Refuge Money Vendetta

BLOOD, CORRUPTION OF. See ATTAINDER.

BLOOD FLUKE. See ZOÖLOGY (How Zoölogy Affects Human Welfare).

BLOODHOUND, a breed of hound, distinguished by a remarkably keen scent. All hounds are primarily hunting dogs. The blood-



BLOODHOUND

hound, which of all the many breeds is probably nearest the original, is a powerful dog about two feet high at the shoulder; it has a short-haired black-and-tan coat, large, but not broad, head, with wrinkled skin, deep-set hazel eyes, a deep, square muzzle, and long, silky ears. These dogs were once trained to hunt

large game, such as the boar, bear, and stag, and also to hunt man, but now they are chiefly valuable for tracking fleeing or missing persons. In the days of slavery in America, they were used to hunt fugitive slaves. Their name came from their ability to track blood, but so acute is their sense of smell that they are able to pick out a trail that has been crossed and recrossed by many others. They are baffled only by running water. See HOUND. M.J.H.

BLOOD MONEY. See MONEY (Unusual Terms Applied to Money); BLOOD, AVENGER OF.

BLOOD PRESSURE. In its flow through the arteries, the blood exerts a certain tension, or pressure, upon the walls of those vessels. This tension is determined by the strength and rate of the heart beat, the volume of blood, the contractile quality of the arterial walls, and the resistance which the blood flow meets. The amount of pressure is measured by means of an inflatable rubber bag, which the physician fastens around the upper part of the arm. The artery in the arm is compressed, and pressure is increased until the pulse at the wrist ceases to be felt. The point at which the pulse is not felt is noted on the mercury scale, and is known as the maximum, or *systolic*, pressure. This corresponds to the contraction of the heart. As the bag is deflated, the point is noted at which the pulse can again be felt. This indicates the minimum, or *diastolic*, pressure, corresponding to the relaxation of the heart. The difference between these two is the *pulse* pressure. In cases of high pressure, the systolic may range from 150 to 250 millimeters, and the diastolic, from 110 to 130. Normally, adults up to middle age have a systolic-pressure range of about 110 to 135. After middle life, the figures are a little higher.

High blood pressure is often associated with hardening of the arteries (see subhead under ARTERIES) and chronic kidney disease, but it is sometimes found in persons who show no impairment of the arteries or the vital organs. This type of high pressure is called *essential hypertension*. Such cases are thought to be due to a constriction of the finest branches of the arteries, as a result of which normal circulation is carried on only through extra work on the part of the heart. Long-continued high pressure may itself bring on hardening of the arteries, being then the cause, rather than the effect, of this condition.

Persons in middle life who find themselves getting short of breath on exertion, and who occasionally have attacks of vertigo and headache, should have a thorough physical examination. When high blood pressure is found to be present, the subject should modify his habits of living, in accordance with a physician's directions. Many deaths from heart failure

and apoplexy might have been avoided by proper precautions early in the history of these cases.

Chronic low blood pressure occurs in persons who have ptosis (falling of the upper eyelid) or misplacement of the abdominal organs. It is not associated with any grave organic conditions. Acute low blood pressure is present in fainting and in shock. It is a measure of the severity of shock and of the threatened disaster from shock. W.A.E.

BLOODROOT, sometimes called INDIAN PAINT or RED PUCCOON, one of the earliest spring flowers found in Canada and the United States. Its root and sap are rich orange-red,



BLOODROOT

hence the name. The leaves are heart-shaped and deeply lobed; and, as they are folded around the flower stalk, they come from the ground singly. Each stalk bears one dainty white or rose-tinted blossom. The plant is rich in tannin, and has been used as an astringent. The juice, at one time employed by the Indians as war paint, is now used by them for dyeing baskets. B.M.D.

Scientific Name. The bloodroot belongs to the poppy family, *Papaveraceae*. Its botanical name is *Sanguinaria canadensis*.

BLOOD-STANCH. See FLEABANE.

BLOODSTONE. See HELIOTROPE (Gem).

BLOODSUCKER. See LEECH.

BLOOD SWEAT. See HIPPOPOTAMUS.

BLOODY ASSIZE, as size'. See JEFFREYS, GEORGE.

BLOOMFIELD, N. J. See NEW JERSEY (back of map).

BLOOMFIELD-ZEISLER, FANNIE. See ZEISLER, FANNIE BLOOMFIELD.

BLOOMINGTON, ILL. See ILLINOIS (back of map).

BLOOMINGTON, IND. See INDIANA (back of map).

BLOUNT, *blunt*, WILLIAM, the first man in the United States to be impeached. See IMPEACHMENT.

BLOWFISH. See PERCH.

BLOWFLY, a large blue and black fly, about twice the size of the ordinary house fly, which lays its eggs upon meat or dead animals, or on the sores of living animals. These eggs are



BLOWFLY

The figure at the left is about twice actual size. At the right is a highly magnified foot of the insect.

called *fly blows*, and they hatch very quickly into maggots, which destroy the meat. In some places, these flies and maggots play an important and useful part in quickly disposing of carrion, but in the house they are a menace, for they carry germs of disease and spread infection. Great care should be taken to keep all food beyond their reach; garbage cans, their favorite breeding places, should be securely covered. The blowfly breeds so quickly that the offspring of one fly may number many thousands in a few days. W.J.S.

Scientific Name. The blowfly is classed as *Calliphora erythrocephala*. It is one of the true flies of the order *Diptera* (which see).

BLOWING MACHINES, a name given to various devices which are used to produce, supply, and direct a strong artificial current of air under pressure. One of the oldest, simplest, and most common of blowing machines is the bellows (which see), which has been used by blacksmiths and workers of metals since time immemorial. Blowing machines are of several kinds, according to the uses to which they are put. Some are used to produce a forced draught, to assist the burning of fire in boilers and furnaces; others are for ventilating purposes, that is, for extracting the foul air from buildings, mines, or ships, and substituting pure air; other special machines are employed for supplying air to blast furnaces, and in the Bessemer process for manufacturing steel. The chief varieties of blowing machines are known as *disk* blowers, *fan* blowers, and *jet* blowers. See, also, **BLOWPIPE**.

Disk Blower. This consists of an axle which has attached to it several blades so arranged as to form a rimless wheel; this is enclosed, and it moves within a cylindrical casing open at both ends. The ordinary electric fan used in offices and homes, which is a form of disk

blower, gives a good idea of the form of this wheel and the way it rotates. As this machine is used for ventilating purposes, it is usually set in the wall of the building, with one opening of the cylindrical casing toward the building and the other to the outside air. The axle and blades are rotated by means of an electric motor, and according to the way the machine is set, it either sucks the foul air from the building or forces fresh air into it.

Fan Blower. The fan blower is the most common of modern blowing machines. It is like the disk blower, except that the axle of the fan blower is provided with radial spokes, as in a rimless wheel, to the ends of which are fastened blades arranged parallel with the axis. This wheel is located inside of a circular casing of steel or cast iron, within which it is made to revolve rapidly. When this wheel revolves, it causes the air within the casing to revolve also. In this way, a centrifugal action is set up, by which there is a diminution of pressure at the center of the machine and an increase of pressure against the sides of the casing. The air is then sucked in through circular orifices at the central side of the casing, and is forced out through an outlet in the side; this outlet is called the delivery tube.

Jet Blower. Another kind of blower in common use is the jet blower, in which a jet of steam is used to produce a current of air. The principle upon which it is based is as follows: When a jet of steam is allowed to escape through a small opening, or through a tube of small diameter which is inserted into a larger tube open at both ends, it creates a current of air. The air is pushed in the direction of the escaping jet, and a fresh supply is drawn in through the other opening, so that a continuous stream of air passes along the tube. The exhaust nozzles used in the smokestacks of locomotives and fire engines are examples of jet blowers.

BLOWPIPE, a small tapering tube used to direct a current of air upon a flame, forcing it in any desired direction and causing it to burn very rapidly, thus intensifying its heat. In its simplest form, the blowpipe consists of a funnel-shaped tube of brass or glass, usually seven inches long and one-half inch in diameter at the larger end, and tapering to a very small opening at the lower end. Within about two inches of the smaller end, the pipe is bent nearly to a right angle, so that the fine current of air may be directed away from the operator. See **BLOWING MACHINES**.

BLUBBER, the fatty strip which lies just beneath the skin of whales and other warm-blooded sea animals, furnishing a protection against cold. When refined, it yields oils for lubrication, fuel, and soap-making. Whale oil was extensively used in lamps until petroleum was discovered, but it is now employed

in such a manner only by the Eskimo. Blubber is an important part of Eskimo diet, and it is also eaten by the Ainos and other inhabitants of northern Japanese territory. See WHALE; AINO.

BLÜCHER, *blu' Kur*, GEBHARD LEBERECHT VON, Prince of Wahlstadt (1742-1810), the famous Prussian general whose timely arrival with reinforcements saved the day for the allies at the Battle of Waterloo and crushed the great army of Napoleon Bonaparte. Throughout the wars with Napoleon, he was one of the most bitter and untiring foes of that conqueror, and even after the Peace of Tilsit, when Prussia was made a dependent state of Napoleon's empire, he was never shaken in his belief that his country could be liberated.

When the Prussians renewed the war against the French in 1813, Blücher shared in the glory of Napoleon's defeat at Leipzig. After Napoleon's return from Elba, Blücher was placed at the head of the Prussian troops, and he led his army to Belgium. Napoleon defeated the Prussians at Ligny, after his return from Elba, and then turned swiftly to attack the English, who were concentrated near Waterloo under the Duke of Wellington.

On June 18, 1815, the great Battle of Waterloo was fought. Throughout the day the French hurled themselves in vain against the squares of British troops, while Wellington, knowing that his soldiers were growing tired, anxiously waited for reinforcements and prayed for either "Blücher or night!" At last the Prussians swept upon the field, and the battle was won.

That he might suitably reward Blücher for his services, Frederick William III of Prussia created in his honor the Order of the Iron Cross. See IRON CROSS; WATERLOO, BATTLE OF.

BLUE, one of the colors usually classed as a *primary* (see COLOR). It appears in nature most permanently and brilliantly in stones, such as the turquoise, sapphire, lapis lazuli, and labradorite. It may also be seen in the clear sky and the sea, in flowers, and in the feathers of birds such as the peacock and bluebird. There are many blue paints and dyes prepared from minerals or from plants. Only a few of them are permanent colors; of these ultramarine, prepared from the mineral lapis lazuli, and cobalt blue, made by mixing aluminum and cobalt salt, are the best known. Indigo is the most common vegetable source of blue. In the three- and four-color processes of printing, blue is one of the basic colors. See PRINTING (Color Printing). A.L.F.

As an Emblem. Blue has been adopted at various times as a badge, or symbol. The Scotch Covenanters of the seventeenth century chose it as their emblem in opposition to the royal red, and from this

circumstance came the expression *true blue*, originally applied to a loyal Presbyterian. The winner of the first prize for an animal or other exhibit is said to carry off the *blue ribbon*, this expression having originated in England, in the use of a blue ribbon as the distinguishing badge of the Knights of the Garter, an order founded by Edward III.

Historical. The phrase, *boys in blue*, applied to soldiers on the Union side in the War of Secession, to distinguish them from the Confederates, the *boys in gray*, long remained a current expression. There is a well-known Memorial Day poem by Francis Miles Finch which has as its refrain—

Under the sod and the dew,
Waiting the Judgment Day;
Under the one the blue;
Under the other, the gray

BLUEBACK, a species of salmon (which see).

BLUEBEARD, *blu' beerd*, the bloodthirsty hero of a famous legend, who murdered in succession six wives and was himself killed by the brothers of the seventh. The story first appeared in a book of fairy tales written in the seventeenth century by a French author, Charles Perrault (which see). The chief character is supposed to have been suggested by an historic personage of the fifteenth century, Gilles de Laval, who was remembered chiefly on account of his inhuman acts of cruelty.

In Perrault's story, Bluebeard, so called because of the tint of his beard, entrusted to his wife Fatima the keys of his castle, warning her not to open the door of a certain room while he might be absent. Impelled by curiosity, Fatima opened the forbidden door and discovered a chamber in which lay the bodies of the six wives who had preceded her. On his return home, Bluebeard learned of her act of disobedience, by the blood on the key, and only the timely arrival of her brothers, who speedily put an end to the brutal husband, saved her from sharing the fate of her predecessors. The essential details of this story are found in the folklore of various peoples.

BLUE BEECH. See IRONWOOD.

BLUEBELL, the popular name for several blue, bell-shaped flowers. Probably the name is associated most commonly with the *bluebell of Scotland*, also known as *hairbell* and *harebell*. This charming wild flower is widely distributed in Europe, Asia, and North America. It may be found both on the high mountain slopes and by the wayside; its lovely blue flowers, borne on slender stems, withstand the roughest winds. The blue blossom hangs downward; it forms a roof to shield the pollen from the rains and to keep out unwelcome insect visitors, but the bees cling to the pistils and dip far into the bells for their nectar. Bluebells make hardy flower borders. (See illustration on page 804.) See COWSLIP; LUNGWORT. B.M.D.

Scientific Names. The bluebell described above belongs to the bellflower family, *Campanulaceae*.

Its botanical name is *Campanula rotundifolia*. A related species, *C. medium*, the Canterbury bell, is also a favorite in old gardens.

BLUEBELL OF SCOTLAND. See CAM-PANULA.

BLUEBERRY. See HUCKLEBERRY (The Blueberry).

BLUEBIRD, a beautiful wild bird of the thrush family, whose soft, pretty warble is one of the earliest songs of approaching spring, as Bryant tells us in his *Yellow Violet*:

When beechen buds begin to swell,
And woods the bluebird's warble know
The yellow violet's modest bell
Peeps from the last year's leaves below

This welcome and useful songster ranges in North America from the Gulf of Mexico into Southern Canada, and as far west as the Rocky Mountains. The bluebirds that spend the summer in Canada and Northern New England visit Virginia and the Carolinas in the winter, while those of the Middle states migrate farther south. From March to November, in the Middle and Northern states, they are among the most interesting and lovable of the wild birds that nest in the yard, orchard, or



BLUEBELL (SEE PAGE 803)

garden. The male, distinguished by bright-blue upper parts, reddish-brown breast and white under parts, is a most devoted husband, though he permits his active little mate to do the bulk of the work of nest-building; he prefers to show his admiration by outbursts of song in her honor and by bringing her choice insects for her bill of fare.

The nest of the bluebird, which is placed in a hollow tree, a deserted woodpecker's hole, or other crevice, or in a bird house, if one is at hand, is not an elaborate structure, for it is thinly lined with grass or feathers. The pale-

blue or nearly white eggs number from four to six or seven, and two or three broods are raised each season. The baby birds are black at first; the blue feathers appear by the time



BLUE BIRDS

the young wings are ready for the first flight. The birds are seven inches long when full grown. They feed upon spiders, grasshoppers, beetles, and other insects, and, as winter approaches, on various wild berries of the autumn woods. The bluebird is welcomed as a destroyer of harmful insects no less than for its cheery singing and agreeable manners. Other species or varieties of bluebirds are found on the Pacific coast and in the Rocky Mountains. They resemble the Eastern bluebird in color, habits, and song. See BIRD; THRUSH.

Scientific Name. The thrush family is *Turdidae*. The bluebird described above is *Sialia sialis*.

BLUEFIELD, W. VA. See WEST VIRGINIA (back of map).

BLUEFIELDS. See NICARAGUA; MOSQUITO COAST.



BLUE BIRD FOOD

D.L.

BLUEFISH, a sea fish common on the eastern coast of America, from Brazil to Nova Scotia, and found also in the Indian Ocean and the Mediterranean Sea. It is remarkable for its voracity and destructiveness. Large schools of bluefish, one of which was recorded as four or five miles long and a mile wide, prey incessantly on smaller fish, especially menhaden. It is conservatively estimated that an individual bluefish will devour twice its own weight of fish in one day. These fish attain a maximum length of about three feet and a weight of not over fifteen pounds. They are caught in nets and by hook, and are popular with sportsmen because they are game fighters. The flesh is well flavored and much esteemed for the table.

L.H.

Scientific Names. The common bluefish described above is *Pomatomus saltatri*. It is the only species of the family. The name is also given to a California representative of the weakfish family, *Cynoscion ripinnis*.

BLUE FLAG. See IRIS.

BLUE GRASS, a name applied to several species of wild and cultivated grasses that have bluish-green stems. The species generally referred to when the name is used without any qualifying term is the grass that gave Kentucky its popular name of "Blue Grass State." This grass comes to maturity in June, and is sometimes called *June grass*. It flourishes only in rich, fertile soil, and its abundant growth in Kentucky can be attributed to the limestone formation of that state. The special blue-grass region is a section in the north-central part; it is here that Kentucky breeds its famous thoroughbred horses. Tennessee and Missouri also have stands of this blue grass.

The grass has many long, narrow root leaves, and is one of the most nutritious of pasture grasses. Because of its early-maturing habit and its tendency to wilt during hot weather, some farmers keep the grass closely cut after the spring growth has made headway, thereby keeping the pastures green all summer. Blue grass is preëminent as a lawn grass from Tennessee northward to Canada. Properly fertilized and regularly mowed, it may remain green, midway in this region, ten months of the year.

B.M.D.

Classification. The blue grass of Kentucky is classed as *Poa pratensis*, in the family *Gramineæ*. The common blue grass of Canada is *Poa compressa*. Another well-known grass bearing this name is Texas blue grass (*P. arachnifera*).

BLUE GRASS STATE, a popular name applied to Kentucky (which see). See, also, BLUE GRASS, above.

BLUE-GUM. See EUCALYPTUS.

BLUE HEN STATE, a popular name applied to Delaware. See DELAWARE (History).

BLUE JAY. See JAY.

BLUE LAWS, the name applied to a set of laws regulating the conduct of the members of the colony of New Haven, Conn. Many of these, once supposed to be genuine and binding upon the deeply religious people, now are known to have been exaggerated, in some degree, by Rev. Samuel Peters, a minister who was driven from the colony to England, and who thereafter devoted himself to ridiculing the Americans. Among those laws which are declared to have been passed were the following:

No one shall be a freeman or have a vote, unless he is converted and a member of one of the churches allowed in the dominion.

No one shall cross a river on Sunday but an authorized clergyman.

No one shall run on the Sabbath day, or walk in his garden, except reverently to and from meeting.

No woman shall kiss her child on the Sabbath or fasting day.

No one shall travel, cook victuals, make beds, sweep houses, cut hair, or shave on the Sabbath day.

Whoever wears clothes trimmed with gold, silver, or bone lace, above two shillings by the yard, shall be presented by the grand jurors, and the selectmen shall have that clothing confiscated.

No one shall read common prayer, keep Christmas or saint days, make minced pies, dance, play cards, or play on any instrument of music, except the drum, trumpet, and Jew's-harp.

Every male shall have his hair cut round according to a cap.

No gospel minister shall join people in marriage. The magistrate may join them, as he may do it with less scandal to Christ's Church.

A man who strikes his wife shall be fined £10.

A woman who strikes her husband shall be punished as the law directs.

When parents refuse their children convenient marriages, the magistrate shall decide the point.

A drunkard shall have a master appointed by the selectmen, who are to debar him from the liberty of buying and selling.

Whoever publishes a lie to the prejudice of his neighbor shall sit in the stocks, or be whipped fifteen stripes.

Laws even more drastic than these were actually passed at various times by the Massachusetts and New Haven colonies. The name *blue laws* came into use when the colony of Connecticut printed a set of rules and bound them in a blue paper cover.

Modern Blue Laws. The term is applied at the present time to legal restrictions in matters of conduct that are usually left to the conscience of the individual. Laws regarding the observance of Sunday are very often known as blue laws, and those who oppose the restriction or abolition of liquor selling quite generally regard prohibition measures as belonging to the same classification.

BLUE LITMUS. See ACID.

BLUE PRINT, a photographic print of original plans prepared for the use of architects and engineers to guide them in the construction of buildings, bridges, and other engineer-

ing works. A blue print is produced by preparing a sensitive paper by brushing it over with a solution of oxalic acid and iron and then treating it with a solution of potassium ferrocyanide; the drawing, made with India ink on material that will allow light to pass through it, is placed over the paper and exposed to intense light. After exposure, the paper is washed in pure water, and white lines are found where the black lines appeared on the drawing. The completed print is therefore composed of white lines only, on a solid background of blue. Blue photographic prints from ordinary negatives can be made in the same way.

BLUE RACER. See BLACKSNAKE.

BLUE RIBBON. See BLUE (As an Emblem).

BLUE RIDGE, the most easterly range of the Appalachian Mountain system in North America, extending across New York, New Jersey, Pennsylvania, Virginia, and the Carolinas, into the northern parts of Georgia and Alabama. In the southern portion, this range is crossed by the Black, the Nantahala, and the South mountains. In the strictest sense, the name applies only to that portion of the range which crosses Virginia and separates the Piedmont region from the Great Valley. The highest peaks are about 4,000 feet in altitude. The Hudson, the Potomac, and several other rivers have cut their way through these mountains, and thus form narrow, picturesque valleys. See APPALACHIAN MOUNTAINS; PIEDMONT REGION; GEORGIA (The Land).

"BLUE SKY" LAWS, statutes which regulate the issue and sale of stocks, bonds, and other securities. The origin of the term is uncertain, but it is supposed to have been derived from the remark of a Kansas bank commissioner, who said that unscrupulous companies were capitalizing the blue sky. Some of the stocks and bonds offered continually to the public have little more than "blue sky" as security, and it is to prevent such frauds on the public that laws have been passed to protect investors. The importance of such protection may be understood when it is known that each year, in the United States alone, the investing public is defrauded of \$100,000,000 to \$125,000,000 by dishonest promoters.

The lead in this form of legislation was taken by Kansas in 1911, as the result of the activity of a large number of companies fraudulently claiming to own valuable oil lands in Oklahoma. About forty of the states of the Union now have similar laws. Usually the law requires dealers in stocks and bonds to have a state license, and to file with the proper authorities all information about the securities they offer for sale—the amount of the issue, the actual value of the property in hand, etc. The enforcement of the law is sometimes placed in the hands of the regular state officers,

or of commissions, such as the bank commissioner, or the utilities commission, but usually a special board is created. See BOND; KANSAS (Government).

F.H.E.

BLUESTONE. See COPPER; BLUE VITRIOL.

BLUE VITRIOL, *vil' ri ul*, or **BLUESTONE**, is a compound of copper and sulphuric acid, usually seen in the form of dark-blue crystals. Its chemical name is *copper sulphate*. Blue vitriol is one of the most useful compounds of copper. It is used in calico printing and dyeing, in making electrotypes, in copperplating, and for preserving timber; also in electric batteries, and in the production of other compounds of copper. It is poisonous, and is extensively used in spraying mixtures to destroy insects, and as a fungicide and seed disinfectant (see INSECTICIDES AND FUNGICIDES). When exposed to the air, the crystals lose their water, turn white, and crumble to a powder. The blue vitriol of commerce is obtained as a by-product in refining gold and silver with sulphuric acid. See COPPER.

T.B.J.

Chemical Formula. Copper sulphate in the form of powder has the formula CuSO_4 ; that is, a molecule consists of one atom of copper, one of sulphur, and four atoms of oxygen. When it crystallizes, it forms prisms containing five molecules of water (H_2O). The formula is then $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

BLUE WHALE. See RORQUAL; WHALE.

BLUFF KNOLLS. See WESTERN AUSTRALIA.

BLUING, a blue-colored mixture used in the laundry to whiten clothes. White clothes have a tendency to turn yellowish when laundered, and the bluing overcomes this tendency. Bluing can be purchased in liquid form; bluing paddles and bluing balls are also in common use. The substances used in manufacture are soluble Prussian blue and coal-tar blue. The liquid preparations are so strong that the equivalent of a teaspoonful is usually all that is needed to blue the water used in rinsing a tub of clothes.

BLUNDERBUSS, a corruption of a Dutch word meaning *thunder box*, is applied to an old-fashioned, smooth-bore, muzzle-loading gun. The barrel terminated in a somewhat bell-



THE BLUNDERBUSS

shaped muzzle, and several bullets could be put in at one load. The weapon was effective at short range, as the charge scattered widely, and some of the bullets were almost certain to take effect. It became entirely obsolete with the introduction of breech-loading guns,

but the word is much used in a figurative sense to apply to anything which does not concentrate effort.

BLUSHING, which causes the face and neck to redden, is brought about by the stimulation of certain nerves called *vaso-dilator*. As a result, the arteries become larger and more blood flows through them. Blushing is accompanied by a sensation of warmth in the face. Children blush less frequently than older persons, because they are too young to have the mental states that cause blushing—that is, modesty, shame, and similar sensations. *Unblushing* is often applied to a person who is so hardened that he has lost the sense of shame. Mark Twain once said, "Man is the only animal that blushes—or needs to."

Terror produces a physical state the opposite of the one described above. The vaso-constrictor nerves are in this case stimulated, which causes the tiny blood vessels to contract. The amount of blood is thus lessened, and the skin grows cold and pale.

K.A.E.

BOA, *bo' ah*, the name applied to a group of tropical American serpents of great size and enormous strength, but without poison fangs.



THE BOA CONSTRICTOR

Though they cannot swallow horses, oxen, and other large animals, as is sometimes asserted, boas can swallow animals much larger than their own heads, for their jaws are joined by an elastic substance which allows them to stretch both vertically and horizontally.

The boas are generally found in dense forests, where they suspend themselves from tree branches and seize animals passing beneath. With their strong teeth, pointing backward toward the throat, they easily hold a small animal, round which they wrap a fold of the body and quickly crush it to death. After a meal, a long sleep is taken, lasting sometimes a week, until the food is thoroughly digested; bones, horns, and other indigestible substances are disgorged, and the serpent is ready for another meal. However, it can live in comfort several weeks without eating.

The most common species is the *boa constrictor*. It is found chiefly in Guiana and

Brazil. This serpent seldom exceeds twelve feet in length; stories of boas thirty and more feet in length are fabrications, though the *anaconda*, which belongs to the same family, attains a length of nearly thirty feet. In Arizona and other southern parts of the United States, two very small species of boas are found. They live chiefly on small animals and insects. Small individuals are sometimes brought into the country in bunches of bananas. See ANACONDA.

L.H.

Scientific Names. The boa family is *Boidae*. The common boa is *Boa constrictor*. Other species include the imperial boa, *B. imperator*; the Mexican *B. divinitoquæ mexicana*; and the ringed boa, *Epicrates cenchris*.

BOABDIL, *bo ahb deel'*, OR **ABU-ABDAL-LAH**, *ah boo' ah dahl' ah*, also called THE LITTLE and THE UNFORTUNATE, was the last Moorish king of Granada, which is now a province of Southern Spain. Boabdil claimed the throne in 1482, and expelled his father, who died of a broken heart. Because of his tyranny, his subjects were not loyal. Taking advantage of such unsettled conditions, the Castilian army of Ferdinand and Isabella, king and queen of Castile and Aragon, was sent to besiege Granada. Its surrender was obtained in January, 1492, only a few months before Queen Isabella assisted the enterprise of Christopher Columbus. Riding away from his lost kingdom, Boabdil turned for a farewell look, and that spot is still shown to tourists as "the last sigh of the Moor." Later Boabdil went to Africa, where he is said to have been killed while fighting for the ruler of Fez. In Irving's *Alhambra*, a literary masterpiece, he is a prominent character. See MOORS.

BOA CONSTRICTOR. See BOA.

BOANERGES, *bo a nur' jeez*. See APOSTLES (John).

BOAR, the male hog (which see)

BOAR, WILD, the wild hog of Europe, North Africa, and Asia Minor, far exceeding

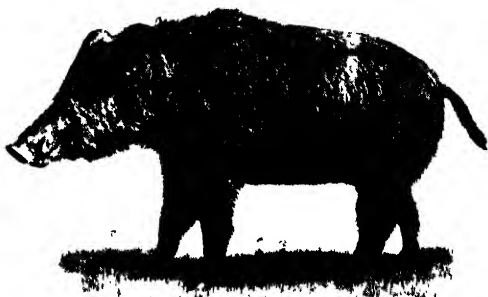


Photo. U & U

WILD BOAR

in size the largest of domestic hogs. From very early times, hunting the wild boar was a favorite pastime of kings and nobles, and



ON THE BOARD OF TRADE

Buying and selling grain in the wheat pit. At right, posting prices of grain as telegraphed from various cities

in most countries the animals were carefully preserved for this purpose. In England, in the days of the Norman kings, a person killing a wild boar without royal permission was liable to have his eyes put out. In most parts of Europe, this animal in its free state is extinct; while it is preserved on some large estates, the sport of boar-hunting has greatly declined.

It is grayish-black in color, with short hair and coarse bristles. It has formidable tusks, and is a dangerous enemy when wounded. The boar hunt, on foot, with spears and hounds of a strong and fierce breed, was an exciting and dangerous sport. In India, a boar of larger species, forty inches high at the shoulder, is hunted on horseback, and "pig sticking" is there a popular sport.

The wild boar feeds at night on roots and grain, though it will sometimes eat small animals and birds' eggs. Its meat was once considered far superior in flavor to the flesh of the domestic hog. The boar's head was brought to table at feasts with great ceremony in ancient and medieval times. W.N.H.

Scientific Name. The wild boar belongs to the family *Suidae*. Its scientific name is *Sus scrofa*.

BOARD OF HEALTH, an organization established by local governments (city and state), formed to protect the health of the community over which it has jurisdiction.

A city board of health is provided for in the charter under which the city government is organized; a state or provincial board is provided for by the legislature. In townships and counties, the boards of trustees and supervisors usually act as the board of health for the territory under their jurisdictions. Their powers and duties are prescribed by law.

Duties. The duties of the board of health in a large city are more numerous than those of one in a small town or village, though they are of similar nature. The most important of these duties are to prevent the spread of con-

tagious diseases by enforcing quarantine regulations, and in many towns by requiring vaccination of children before they enter school; to prevent the sale of unwholesome food; to see that garbage is collected and removed regularly; to see that dead animals are removed and properly disposed of; and to perform such other duties as the city council may direct.

The duties of state boards of health are of a more general nature than those of a city board. In many cases their work is advisory; they render important service by investigating causes of disease and publishing bulletins giving information that will prevent the spread of any particular malady. Recommendations to the state legislature often secure the enactment of laws in the interest of public health. In some states, pure-food commissions perform the duties of a state board of health.

There is no national board of health in the United States. The duties of such a board are performed by inspectors of foods and drugs, under authority of the Drug Act, which is enforced by the Bureau of Chemistry, by the Bureau of Animal Industry (which inspects meat products), and by the United States Public Health Service, formerly the Marine Hospital Service. See SANITARY SCIENCE.

BOARD OF TRADE. The farmer raises wheat, oats, rye, corn, etc., expecting to sell in the highest market and reap a profit to which his hard labor entitles him. Does he fix the price for his grain, and can he demand that he shall receive that price? If he had the only good crop in the land, he probably could get whatever price per bushel he demanded, but thousands of others have like crops, and not one of all those farmers has the means of knowing whether the combined crops of all will meet or exceed the world's demands. And upon the demand the price per bushel is based. Moreover, the farmer acting independently would have trouble to learn where there was need of his wheat or corn, and therefore would find difficulty in securing a market.



GRAIN PITS AND CASH-GRAIN TABLES



GRAIN MARKETING AND WEIGHING DEPARTMENT

At the left is a view of the room in the Chicago Board of Trade in which sales and purchases are made during the feverish hours of trading. At right, grain inspectors are at work

We know that he may take his grain to the nearest village any day and sell it. His daily paper tells him the price that prevailed the day before. If he is a careful reader, he knows the possibilities as to higher or lower prices in the future; he may determine to sell at once or to hold his crop until he can get more money for it.

Who fixes the price per bushel, and how is the price determined? Is it controlled by a group of men, and is the farmer at their mercy? Many people believe that powerful men with immense capital control the situation, and that they can raise or lower prices at will—in other words, that they gamble on the upward or downward turn of the market, and that the weight of their dollars turns the scale in the direction of higher or lower prices. This is almost entirely a mistaken idea. If such a condition ever should exist, there would be instant demand for legislation against it.

Prices are fixed by men, it is true, but they are forced in the beginning to recognize what is a just and reasonable price for all grains. It is a well-established principle that wheat should average in price, year after year, much more than one dollar per bushel. A group of men in Chicago and another in Liverpool are secondarily responsible for any changes from an average price. The dominant influences which control price are the *supply* of a product and the *demand* for it. The two groups of responsible men who dictate prices are guided primarily by these two conditions. They are members of organizations known throughout the world as *boards of trade*.

The reason for the location of the most important boards of trade in Chicago and Liverpool is that Liverpool is the world's greatest wheat market, and Chicago is the great market of the western hemisphere, close to the vast grain-producing sections, and the largest grain-shipping center in the western world. Therefore, Liverpool and Chicago men are

naturally able to determine more accurately than other people what the grain supply for any year is to be. Their agents, located all over the grain-producing areas, make daily reports of crop conditions and prospects. The world's demand for cereals is quite accurately known from year to year; therefore it is not difficult to determine whether there will be enough grain to meet the demand. Prospects of a shortage will raise the price; evidence of overproduction will naturally make every bushel less valuable.

The board of trade in Chicago reflects every day the world's crop conditions. Wheat may sell at \$2.25 per bushel as a result of dryness over a vast grain area, thus making an average crop doubtful. One night over the wires may flash a report of heavy rains extending the length and breadth of that area. The next morning operators on the board of trade will hammer the price downward, for the wheat-crop prospects have changed for the better, and the cereal will clearly bring less money per bushel. Thus do prices fluctuate. Boards of trade in other cities receive telegraphic quotations from Chicago and Liverpool, and almost instantaneously prices are equalized throughout the world.

In addition to the above necessary service performed by boards of trade, they have established uniform standards of quality, or grades, of grains. The term *number one hard* applied to wheat means the same throughout the wheat-growing world.

The above is a brief sketch of the beneficial aspects of the board of trade—those activities which in the nature of things some agency must control. There is another and a distinctly different and unfavorable view held by many people, and at times it would appear there is evidence to support it. That there is gambling in the fluctuating prices of cereals is admitted; the gambling instinct is ever present in some men, and they will place bets, regardless of law or moral considerations, upon whatever offers

the possibility of gain. The board of trade seems unable to suppress the speculative tendencies of men determined to venture money upon the rise or fall of prices. Beneath their activity, however, is the inevitable law of production and demand, and seldom do they seriously change stable conditions by their onslaughts upon the markets.

Occasionally, when very unusual conditions have made such operations possible, the speculative instinct has led men to attempt to "corner" the supply of a commodity. A "corner" is an *artificial scarcity* of a grain, created by a combination of men with large capital for the purpose of holding the article affected off the market by buying practically all the visible supply. The object is to extort abnormally high prices. Such efforts seldom succeed. The most memorable attempt to "corner" wheat occurred on the Chicago Board of Trade in 1867, when the price reached \$2.85 per bushel; in 1898 another attempt sent the price to \$1.85 but cost the operator, Joseph Leiter, several millions of dollars in losses.

Transaction of Business. In the midst of all the noise and confusion which the outsider observes on the floor of the board of trade during the hours when it is in session, there is a vast and thoroughly systematized volume of business being transacted with a speed which amazes the onlooker. The brokers on each board of trade have a sign language peculiar to themselves, by which they can make themselves understood above the din constantly prevailing. A sign made with the open hand of the broker toward the person with whom he is in communication signifies "sell"; if he shows the back of his hand, it means "buy"; one finger raised means 5,000 bushels or other unit of the article dealt in; two fingers raised signify 10,000 bushels, and so on. The circular platform or depression where the business is transacted is called the "pit."

Margins. The practice of dealing in margins has become a leading feature of the business of all boards of trade. According to this method of dealing, the trader deposits with his broker a sufficient amount to cover the ordinary fluctuations in price, and the broker furnishes the rest of the necessary capital. For instance, in January the trader wishes to buy 5,000 bushels of wheat for delivery in February. If the prevailing price is \$1.50 a bushel, he may advance his broker \$500, which is a margin of ten cents a bushel; he may margin it for even two or three cents per bushel, if he prefers. If the price of wheat advances, he can order the broker to sell it, and if he chooses, he may withdraw his margin as well as a profit, according to the extent of the rise. In case the margin is ten cents per bushel, if the price recedes below \$1.40, or below the point where his margin will cover the loss, he must either de-

posit enough margin with his broker to cover the falling off, or lose what he has advanced.

Settlement. Most boards of trade have their own clearing houses; at the end of each business day, all parties who have been trading on the board must send reports of sales and purchases to the clearing house. Those whose reports show net loss must send certified checks for such amounts, and those who have made net gains are paid.

Rules and Regulations. The most stringent regulations are made to prevent fraudulent practice on the board. The smallest fraud on the part of any member, however prominent he may be, is punished by suspension, and his trial is prosecuted with a rigid impartiality not surpassed by the courts of law. A board of trade contract matures on the last day of the term mentioned in it, and all transactions between members for purchases or sales on the floor of the board are strictly construed as contracts under its rules.

The distinction between so-called *long* and *short* transactions is as follows: In the former, the trader buys, expecting a later advance in price to net him a profit; in the latter, he sells, expecting a subsequent decline.

Caution. While boards of trade are reputable commercial organizations, the manner of transacting business is such that the inexperienced trader is out of place there, since his judgment of the market may be exceedingly faulty. Because of this lack of good judgment, very frequently he loses his investment. See CHAMBER OF COMMERCE. F.H.E.

In Literature. Two novels dealing realistically with the production and distribution of wheat are Frank Norris's *The Pit* and *The Octopus*.

BOAT. See SHIP; CANOE AND CANOEING; YACHT AND YACHTING; MOTOR BOAT.

BOATSWAIN, *bo't' swane*, called by sailors *bo's'n*, is a petty officer on board a ship. In the old-time naval vessels, he was responsible for the sails, rigging, colors, anchors, cables, and cordage. After ten years of service, a boatswain may become *chief boatswain*, a commissioned warrant officer below the ensigns. On merchant ships, the boatswain is next in importance to the mates.

Literary Reference. The "bo's'n" is a character known to all readers of sea stories, but perhaps the most remarkable specimen is in W. S. Gilbert's *Yarn of the Nancy Bell*, whose hero is—

A cook and a captain bold,
And the mate of the Nancy brig,
And a bo'sun tight, and a midshipmite,
And the crew of the captain's gig.

BOATSWAIN (bird). See TROPIC BIRD.

BOAZ. See RUTH.

BOBCAT. See LYNX.

BOBOLINK, *bob' o lingk*, a North American wild bird, named in imitation of its gay and

sprightly song, in which the sounds of *bob-o-lee*, *bob-o-link*, can be heard distinctly. Bryant's charming poem, *Robert of Lincoln*, with its "bob-o'-link, bob-o'-link, spink, spank, spink,"



Photo: Visual Education Service

A PAIR OF BOBOLINKS

Above, the male, with his brilliant coat, below, the female, in more somber hues

is known to everybody. Many naturalists have tried to give a realistic description of the melody of Robert of Lincoln, and that of Thoreau is worth repeating:

It is as if the bird touched his harp within a vase of liquid melody, and when he lifted it out, the notes fell like bubbles from the trembling strings . . . A child asked, "What makes he sing so sweetly, mother? Do he eat flowers?"

Alexander Wilson, an American ornithologist, wrote of the song in these words:

Some idea may be formed of the song by striking the high keys of a pianoforte at random, singly and quickly, making as many contrasts of high and low notes as possible. Many of the tones are in themselves charming, but they succeed themselves so rapidly that the ear can hardly separate them.

Bobolinks are related to the blackbirds and orioles, and show their kinship in the handsome mating dress of the male. He is a gorgeous creature in his coat of black, with markings of buff and ashy-white on the back of the head, shoulders, back, and wings. In the autumn, the male and female have the same plumage—yellowish-brown above, paler beneath, and a light stripe on the crown. These birds are about seven inches long.

The bobolinks range from Labrador to the West Indies and South America. In March or

April, they appear in the Southern United States and work their way northward, nesting in May in the cool, grassy meadows of the Middle states, New England, and Canada. The nest is well concealed in the tall grass, and contains from four to seven dull white eggs, with irregular markings of lilac and brown.

Far different is the history of the gay-singing bobolink after the southward migrations begin. In August, great flocks appear in the reedy places and marshes of the seacoast and inland waters in the vicinity of New York and Pennsylvania. There they grow fat on the wild rice found there, and are known as *reedbirds*. By order of the Federal government, hunters are forbidden to shoot them, though their flesh is then delicious. At this period, the happy, melodious song of spring is never heard. From the Middle states the birds fly southward as the year advances, finally reaching the cultivated rice fields of the Southern states. Known then as *ricebirds*, they damage the growing crops, and a special Federal permit allows them to be shot on rice lands in North and South Carolina, Georgia, and Florida, but not after November 15. Winter finds them located in the West Indies and South America. Their yearly migration involves a round trip of 10,000 miles.

D.L.

Scientific Name. The bobolink belongs to the blackbird family, *Icteridae*. It is classed as *Dolichonyx oryzivorus*

BOBWHITE. See QUAIL.

BOCCACCIO, *bok kah' cho*, GIOVANNI (1313-1375), an Italian novelist and poet, the earliest writer of classic Italian prose, and the author of some of the most famous stories in the world's literature. He was the son of a merchant of Florence, and early showed unusual talent, writing verses before he was seven years of age. Nevertheless, he spent several years in the study of law before he was able to devote himself entirely to literature.



Photo. Brown Bros.

BOCCACCIO

Early in his career, Boccaccio fell in love with Maria, daughter of King Robert of Naples, and his first work, a romantic love tale in prose, *Filocolo*, was written at her command. The *Decameron*, or *Ten Days' Entertainments*, on which his fame rests, is a collection of one hundred tales, supposed to have been related in ten days by a party of ladies and gentlemen who had withdrawn to a country house near

Florence while the plague was raging in that city. In these tales, Boccaccio reveals himself as a master of the art of story-telling, and their influence on later writers was tremendous. Though vividly told and beautifully written, they are marred by the coarseness that was characteristic of the age in which their author lived, and are fit to be read only in carefully expurgated form.

BODY OF CIVIL LAW (*Corpus Juris Civilis*). See JUSTINIAN I.

BOEHMERIA, *bo me' ri ah*, a genus of plants belonging to the nettle family, one species of which is the source of the commercial fiber ramie. There are really two plants that yield a usable fiber; authorities do not agree as to their designations. Both of these plants are common throughout Eastern Asia. One of them (*Boehmeria nivea*) has leaves that are downy on the under surface. The other (*B. nivea tenacissima*), considered a variety and not a separate species, has its leaves green on both sides, and produces a tougher fiber. *China grass*, *ramie*, and *rhea* are used interchangeably in the trade to designate these plants and their fiber. The United States Department of Agriculture uses the name ramie for *B. nivea*, and China grass for the prepared fiber. *Rhea* is reserved for *B. nivea tenacissima*.

Ramie is cultivated chiefly in China, but also to some extent in Japan. It is commonly propagated by root cuttings. The shoots grow into stalks that may reach a height of

import the raw material for spinning. The prepared fiber is fine, very durable, white, and lustrous, and is woven into very attractive fabrics in the Orient. The American factories use the yarn chiefly for gas mantles. Ramie is being raised in California and Arizona as an experiment, to determine whether it is practicable to produce the fiber in America. B.M.D.

BOEOTIA, *be o' shi ah*, in ancient times, a division of Central Greece lying between Attica



BOEOTIA (IN BLACK)

North of ancient Attica, thus near Athens, the center of old Greek culture

and Phocis, its area was 1,100 square miles. Its shores were washed by two arms of the sea, the Corinthian Gulf, to the west, and the Strait of Euboea, to the east. The northern portion of Boeotia formed the basin of Lake Copais. The sultry, foggy atmosphere of this region was supposed to account for the dullness of the Boeotians, who were stolid and unimaginative.

Thebes, the chief city of Boeotia, was in ancient times the head of an important confederacy of cities known as the Boeotian League. The League assisted the Persians during their invasions, and in the Peloponnesian War it fought on the side of Sparta against Athens. The confederacy was at the height of its power under the Theban generals Epaminondas and Pelopidas, to whose military genius Thebes owed its brief period of supremacy in Greece.

Modern Boeotia is a political division of Greece.

Related Subjects. The reader is referred in these volumes to the following articles:

Epaminondas
Greece (History)

Pelopidas
Sparta



THE RAMIE PLANT

Stalk, leaves, flower, and seed pods

seven feet. In China, the fiber is stripped from the stalks by hand, but chemical processes are employed in such American factories as

BOER, *boor*, a Dutch word meaning *farmer*, generally applied to settlers of Dutch descent in South Africa. In 1652 a party of Dutch left Holland to found a colony in South Africa, where they might obtain religious and political freedom. They were influenced to a considerable degree by the migration of the English Pilgrims, who had sailed to America about thirty years previously, after residence in Holland to escape persecution at home.

In 1796 the territory where they had made their new African homes was seized by the British. The Boers bitterly resented the British rule, and in 1836 numbers of them boldly set forth into the unknown and hostile lands to the north, which afterward became the Orange Free State and the Transvaal. History has no parallel to the record of danger and hardship faced by the Boers on what is known as the "Great Trek" in search of freedom, a prize which they gained but later lost in the South African War. c.w.

Related Subjects. The reader is referred to the article SOUTH AFRICAN WAR and the references there named

BOER WAR. See SOUTH AFRICAN WAR

BOGOTA, *bo go tah'*, capital city of Colombia (which see).

BOG-PUMPER. See BITTERN.

BOHÈME, *LA*, *bo ehm', lah*. See OPERA (Some of the Famous Operas).

BOHEMIA, *bo he' mih uh*, a former crown-land of Austria-Hungary, once an independent kingdom, and now the northwestern corner of Czechoslovakia. It formed the northwestern

its industrial life, and its geographic features are treated in the article CZECHOSLOVAKIA.

History. Its first inhabitants were the Boii, a Celtic people from whom the country took its name, but they were driven out by the Germans during the first century B.C. A Slavic race called the Czechs appeared during the sixth century, and by the ninth, they had been converted to Christianity by the Germans. After forming for a time a part of the Moravian kingdom of Svatopluk, Bohemia became, in the tenth century, a duchy which paid tribute to Germany, but so ambitious were its dukes and so enlightened its policies that the German rulers at length gave it recognition as a kingdom. Its period of greatest glory was from 1253 to 1278, when it was one of the strongest European powers.

During the centuries that followed, Bohemia struggled under the oppression of the House of Luxemburg, and then fell under the rule of the Hapsburgs. Repression of Protestantism by the Catholic Hapsburgs did much to bring on the Thirty Years' War (which see).

From that struggle Bohemia emerged broken in spirit and helpless, with two-thirds of its population dead, and its civilization ruined. Protestantism was utterly crushed, as was all active opposition to the Hapsburg rulers; no really national feeling seemed to awaken until almost a century and a half later, near the end of the eighteenth century. From that time on, the Czech element of the kingdom never ceased to agitate for independence, or at least for official recognition of the Czech language, as opposed to the German. Under the old Austro-Hungarian rule, Bohemia had a diet of about 250 members, but it was not thoroughly representative of the people, and became fully as restless a member of the Austro-Hungarian Monarchy as was Hungary. Long before the close of the World War, Bohemian soldiers of Czech blood openly deserted from the armies of the Dual Monarchy and joined the allied forces, that they might more quickly achieve their dream of independence (see CZECHOSLOVAKIA).

BOII, *bo' e*. See BOHEMIA.

BOIL, an abscess of the skin, the result of a local infection with a pus germ. The most frequent infecter is one of the staphylococci. The bacteria secure entrance through a grease gland, a sweat gland, a hair follicle, or a small, shallow wound. Locating in the deeper parts of the skin, the bacteria cause the neighboring blood vessels to fill with blood and the neighboring tissues to be crowded with leucocytes (white blood cells or pus cells). At first there is a red point. This red point becomes a hard, painful nodule. Next it has been converted into an abscess. The pus may discharge locally. The infection and inflammation may subside, and the pus may be absorbed.



THE ABSORPTION OF BOHEMIA

The ancient kingdom is merged into the republic of the Czechoslovaks.

part of the old Dual Monarchy, has an area of 20,102 square miles, or about half that of Kentucky; population, 6,977,000 in 1929. Primarily an agricultural province, it produces large quantities of rye, wheat, oats, barley, potatoes, and sugar beets; but it was also first among the former Austrian provinces in the possession of mineral wealth. Its resources,

Treatment. It is frequently advisable to open the boil and let the pus out. With the discharge of pus, the boil becomes painless, and it heals rapidly. The application of heat locally eases the pain and "draws the boil to a head." But heat must not be applied as a poultice, nor any other dirty, moist material. The application of poultices causes new boils to develop around the old one. The same statement applies to the application of fat meat and other greases to boils. A tendency to boils may be one symptom of diabetes or excessive amounts of sugar in the urine or blood, or both. Such a tendency may result from keeping the skin greasy or dirty, or permitting irritations. See **ABSCESS**.

To prevent boils, keep the skin scrupulously clean. Avoid all skin irritations. Avoid occupational skin infections. Change the diet. Eat a minimum amount of sugars and starches.

Carbuncle. A localized infection with anthrax bacillus, or with one of the pus cocci located in the fascia below the skin, causes carbuncle. In carbuncle, there is more hardness of the tissue and less suppuration (formation of pus) than in the case of boils. Carbuncles lie deeper than boils. Diabetes is frequently the underlying cause of carbuncle. Poulticing a carbuncle should never be done. Lancing is often more harmful than helpful. For prevention of carbuncles, see method advised for boils.

W.A.E.

BOILER, a vessel in which vapor is generated by the boiling of a liquid. Water vapor (that is, steam) is the kind generated in most boilers, but within recent years the mercury-vapor boiler has come into use (see subhead below). Boilers for steam engines are formed of riveted plates of metal, and are supplied with a furnace in which a fire is made, a grate on which the fire is laid, and an ash pit into which the ashes fall. On top of that part of the boiler containing water is a *steam dome*, into which the steam passes as generated, and from which it is conducted by pipes to the point where it is to exert its power. This may be at considerable distance from the generating point.

The uses to which the steam is put when developed are very numerous, and include the supplying of engines with power for industrial purposes, for driving railroad and marine engines, for heating, and, in fact, wherever

mechanical power is more efficient or more economical than man power. When steam is produced by boiling water in an open vessel, that steam has no power that could be utilized; it simply rises and mixes with the atmosphere. If steam is confined, it endeavors to escape, and in doing so it exercises *pressure*. The higher the temperature is raised, the greater the pressure exerted. See **STEAM**; **STEAM ENGINE**.

Strength of Boilers. The first essential of a boiler is strength to withstand the pressure of the steam without bursting. Boilers are therefore carefully constructed with a strength sufficient to resist a certain amount of power, or pressure, to the square inch. Each boiler is fitted with a gauge which indicates the pressure of steam. There is also an ingenious contrivance called a safety valve, which, if the pressure rises too high, automatically opens and allows sufficient steam to escape to bring the pressure within the safety limit. Powerful modern boilers are constructed to stand a pressure of as much as 200 to 300 pounds per square inch.

Methods of Heating. The main object of all boilers is the same, but that object is arrived at by different methods. It is desirable quickly to heat the water, which is supplied by pipes leading into the boiler, and to maintain that heat as economically as possible. *Fire-tube boilers* are provided with flues, or passages by which the heated gases generated by the fire pass through the chamber containing water. *Water-tube boilers* have

the water in a series of tubes instead of in one compartment, and are considered the safest and most effective style of boiler. Therefore they are widely used.

Upright and Horizontal Models. Boilers may be divided into two classes, namely, *upright* and *horizontal*. The principles of operation are the same in both cases, the difference in shape being simply a matter of convenience. On steamships, upright boilers are obviously more convenient than the horizontal boilers used in locomotives on land would be. Small upright boilers are used on land for industrial purposes, and in some cases for heating large buildings. The cylindrical shape has been universally adopted as being most efficient and most economically maintained in a state of cleanliness.

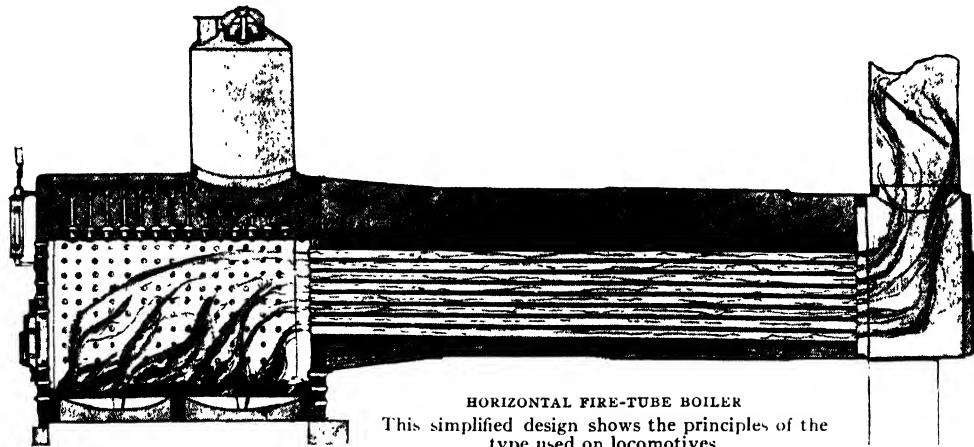


VERTICAL FIRE-TUBE BOILER

The simple principles are shown above. The tubes are like chimneys for the fire, and by passing through the water give a large heating surface.

Horse Power of Boilers. In stating that a boiler is of a certain *horse power*, it is not intended to convey the idea that the power exerted is equal to the power of the same num-

temperature of the boiling point falls in the ratio of 1° F. to about every 550 feet of altitude. At lofty heights, the boiling point of water is so low that food cannot be cooked



HORIZONTAL FIRE-TUBE BOILER

This simplified design shows the principles of the type used on locomotives.

ber of horses. Horse power is a term indicating a definite unit of force, established by the American Society of Mechanical Engineers. The horse-power unit as applied to steam boilers is thirty pounds of water evaporated per hour from a temperature of 100° F. under a pressure of seventy pounds by gauge. What is probably the largest steam boiler in the world, in use in Pittsburgh, is rated at 3,000 horse power. See HORSE POWER.

The Mercury-Vapor Boiler. In this type of boiler the heated mercury passes off as vapor. This is carried through a pipe to drive a turbine, which runs an electric generator. Exhaust mercury vapor passes from the turbine to a condenser, into which water is fed. The water is boiled by the heat of the exhaust, and the resulting steam passes through a pipe to drive a steam turbine. Finally, the mercury, condensed to liquid form, returns through a pipe to the mercury boiler. The joints in the boiler are made mercury-tight by welding, to prevent the escape of poisonous mercury fumes.

BOILING POINT. When heat is applied to liquids at certain temperatures, bubbles of vapor will form in the liquids and escape to the surface. The formation and escape of such bubbles is called *boiling*, and the temperature at which this occurs is in each case the *boiling point* of the liquid.

The boiling point depends upon the amount of atmospheric pressure to be overcome, because the boiling point occurs where the tension of the vapor is equal to the pressure of the atmosphere. Pressure is heaviest at sea level—14.7 pounds to the square inch—where the boiling point of water is 212° F. or 100° C. (see THERMOMETER). In ascending to higher elevations, the pressure diminishes, and the

in open vessels. This fact is sometimes utilized in calculating altitudes at different stages in the ascent of mountains. Thus, the boiling point on the summit of Mont Blanc, 15,781 feet above sea level, is 185° F.

Not all liquids boil at the same temperature. While water boils at 212° F. at sea level, ether boils at 66° , alcohol at 173° , and mercury at 662° . In finding the boiling point, the thermometer is not immersed in the liquid, but is held in the vapor just above the surface. The atmospheric pressure of fifteen pounds to the square inch (called *one atmosphere*) is employed as the unit of measure in mechanics; for instance, in making steam, the pressure of *ten atmospheres*, 150 pounds, raises the boiling point to 356° F. The injection of gases into water lowers the boiling point; impurities in solution raise it. See STEAM; VAPOR. A.L.F.

Applications. Housewives who use steam-pressure cookers effect a saving of time and fuel, because the metal cooker causes the steam to be confined in such a way as to be placed under pressure. The higher temperature resulting from increase of pressure reduces the time of cooking. In the manufacture of condensed milk, a partial vacuum is created in the condensing vessel, and the reduction of the pressure so lowers the boiling point that the water is boiled out without cooking the milk. Food can be cooked more rapidly in a double boiler if salt is placed in the lower part of the vessel, on the principle that impurities in solution raise the boiling point.

Problems. 1 In a certain mountain town, the temperature of boiling water is 192° F. What is the approximate altitude of the town?

SOLUTION

$212^{\circ} - 192^{\circ} = 20^{\circ}$, fall in the temperature of boiling water.

$1^{\circ} =$ fall per every 550 feet.

$20 \times 550 = 11,000$ feet, required altitude.

2. At sea level, the barometer reading is approximately 29.92 inches of mercury (see **BAROMETER**). If water boils at 208° F on a certain elevation, what would be the barometer reading there? Assume a difference of 1 inch for every 900 feet.

SOLUTION

$212^{\circ} - 208^{\circ} = 4^{\circ}$, drop in temperature of boiling water.

$1^{\circ} =$ fall per 550 feet.

$4^{\circ} =$ fall per 4×550 feet = 2,200 feet.

Since an elevation of 900 feet makes a difference of 1 inch of mercury in the barometer, an elevation

of 2,200 feet makes a difference of $\frac{2,200}{900}$ inches, or 2.44 inches

29.92 inches $- 2.44$ inches = 27.48 inches, barometer reading required.

BOIS DE BOULOGNE, *bwah duh boo lone'*, the greatest park in Paris (which see).

BOISE, *boi' za*, IDA. See IDAHO (back of map).

BOK, *bahk*, EDWARD WILLIAM (1863-1930), an American journalist, who as editor of the *Ladies' Home Journal* was called "a lay preacher to the largest congregation in the United States." Under his editorial direction that publication advanced to high rank and through its editorial columns he wielded tremendous power in support of many good causes. The better babies movement, the education of boys and girls in sex hygiene, the campaigns against useless patent medicines and in favor of a sane Fourth of July are some of the causes which he consistently supported.



Photo Brown Bros
EDWARD W. BOK

Bok was born in Holland, but when he was six years old his parents emigrated to the United States, as the result of business troubles through which his father lost his entire fortune. The death of the father soon after their arrival in the United States left the widow and two sons in sore need.

Until he was thirteen Bok attended the public schools in Brooklyn, N. Y. Then he secured work as an office boy, and at seventeen he edited *The Brooklyn Magazine*, which flourished for two years with the encouragement and material help of Henry Ward Beecher, whose church Bok attended. After several years' work as a stenographer for publishers in New York, he founded the Bok Syndicate Press, which furnished special articles to newspapers. In 1889 he became editor of the *Ladies' Home Journal*; in 1901 he was elected vice-president of the corporation which publishes it, and in

1896 he married the daughter of its principal owner. Through these connections he acquired a large fortune, and in 1920 he retired from active life. The next year he published *The Americanization of Edward Bok*, and in 1925 another book of note, *Twice Thirty*. In the summer of 1923, Bok offered \$100,000 for the best plan by which the world might be brought to permanent peace, and in 1925 he headed a movement to influence American action favorable to the World Court (see **PERMANENT COURT OF INTERNATIONAL JUSTICE**). In 1929 he dedicated his "singing tower" in Florida (see **SINGING TOWER**), and near its base he was buried.

BOKHARA, *bo kah' rah*. See **UZBEK**.

BOLA, *bo'lah*. See **SLING**, subhead.

BOLERO, *bo la' ro*. See **DANCING**.

BO'LESZAW THE BRAVE, first king of independent Poland. See **POLAND** (History).

BOLEYN, *bool' in*, ANNE (1507-1536), second wife of Henry VIII of England, of importance in English history not for anything which she did, but because Henry's desire to marry her led to the separation of the English Church from the Church of Rome. As lady of honor to Queen Catharine, she was conspicuous at court, and the king soon fell in love with her. She refused to listen to his addresses, however, unless he would divorce Catharine. Because the Pope would not permit the divorce, Henry denied his supremacy over the Church in England and forced Archbishop Cranmer to pronounce a divorce legal.



Photo Brown Bros
ANNE BOLEYN

The second of the six wives of King Henry VIII of England.

Meanwhile, however, he married Anne in January, 1533, and in the following May she was crowned at Westminster with great splendor. In September she became the mother of Elizabeth, who was later one of England's great rulers. Henry soon tired of Anne, and to make possible his marriage with Jane Seymour, he had her thrown into prison on a charge of infidelity. Though she vigorously protested her innocence and prayed for release, she was condemned to death, and on May 19, 1536, was beheaded. Historians have never settled to their own satisfaction the question of her guilt or innocence, but all agree that she was at times indiscreet.

Related Subjects. The reader is referred in these volumes to the following articles:

Cranmer, Thomas	Henry (VIII, England)
Catharine of Aragon	Seymour, Jane
	Tower of London

BOLIVAR, *bol' i vahr*, SIMON (1783-1830), a South American patriot whose services in behalf of the struggling republics of the South American continent won for him the title of "Liberator." He completed his education by law studies in Madrid and extensive traveling on the continent of Europe, and returned to South America just before the revolutionary uprising of 1810 in his native country of Venezuela. For years he led his people in a heroic struggle against the mother country, Spain, and when, in 1810, New Granada and Venezuela were consolidated into the republic of Colombia, Bolivar was chosen its President. By 1822 the Spanish troops were completely driven out of Colombia, and in that year Bolivar was called upon to help the revolutionists of Peru. In 1824 he was made dictator of that country, resigning a year later when independence had been secured.

The southern provinces of Peru joined together in a separate state in 1825. This was named Bolivia, in honor of the great liberator. To him was entrusted the task of framing a

constitution for the new republic. This was adopted by the Bolivians, but it gave such power to the chief executive that Bolivar was accused of desiring to make himself perpetual dictator of a South American empire. The last four years of his life were full of discord, and though he was chosen President of Colombia in 1826 and 1828, he was forced to retire in 1830, when Venezuela separated from the republic of Colombia.

Bolivar is regarded as the "Washington of South America." Necessity forced him to use arbitrary methods, but he gave himself with supreme devotion and courage to the great object of his life—to unite the South American republics into a strong federation—in which he did not succeed.

Related Subjects. The reader is referred, for additional facts respecting the life of Bolivar, to the following articles in these volumes

Bolivia
Colombia

Peru
Venezuela

BOLIVAR, a coin of Venezuela. See MONEY (Foreign Monetary Standards).



BOLIVIA, *boliv' i uh*, one of the two South American countries which are entirely inland (the other being Paraguay); it lies south of the equator, from latitude $0^{\circ} 35'$ to 22° . Surrounded by Peru, Brazil, Paraguay, Argentina, and Chile, it comes into contact with the leading states of the continent, and itself bids fair to become one of the foremost of them with the development of its rich resources and the extension of transportation facilities. Bolivia has been involved in boundary disputes with all its neighbors; all have been settled except that with Paraguay, which is being negotiated directly under the auspices of the Argentine Republic.

The country's area has been variously estimated, but the best authorities at the present day give the area as approximately 514,000 square miles, and Bolivia thus ranks as the third largest South American state. The average density of the population of about 2,865,000 is less than six to the square mile, and so unevenly are the inhabitants distributed that over vast tracts they average fewer than one to the square mile.

Bolivia was named for Simon Bolivar, the "Liberator."

The People. About fifteen per cent of the inhabitants are of Spanish origin; more than fifty per cent are Indians, and the remainder are of mixed blood, called *mestizos*. The Indians are the descendants of the old Inca empire and other older Indian kingdoms which were only partly subdued by the Inca warriors; therefore the Indians use different languages, those of the northern part of the high plateau speaking "Aymara," and those of the southern section "Quichua." The descendants of the Spaniards fill the leading professional and commercial positions and hold most of the public offices. Spanish is the language of the country.

Government. The government is republican in form, with the executive power vested in a President, who is elected by the people for four years. He may not succeed himself, nor may the two Vice-Presidents succeed themselves. The Congress has a Senate of sixteen members, two for each of the eight government departments, and a Chamber of Deputies of seventy-two members; senators are elected for six years; deputies, for four. Division into eight departments facilitates local government, and these are in their turn subdivided. There is a

Supreme Court and a system of inferior courts. Military service is compulsory; the permanent army numbers 4,000, and there is a large reserve force and a territorial guard.

The Cities. Because of the rich mines of its highlands and the more healthful climate of the western sections, all of Bolivia's important cities are located on the western plateau.



LOCATION MAP

La Paz, lah pahz', seat of the legislative and executive branches of the government, is the highest capital in the world. Perched at an altitude of 12,120 feet, on the steepest inhabited hillsides on the globe, and hemmed in on all sides by snow-capped peaks, it has become one of the greatest railroad centers in South America, since the completion of four great international lines.

Its 150,000 people represent all nations. Originally named in 1548 to commemorate the reconciliation between Pizarro and Almagro (for the name means *the peace*), the city was rechristened La Paz de Ayacucho in 1825, in remembrance of the decisive battle for independence. The latter is its legal name to-day. Popular interest attaches to its cathedral, dating from the seventeenth century, the University of San Andres, the national college, the national museum, a famous statue of Bolivar, the panoramic scenery of the approaches, and the wireless communications established in 1915. The American Institute, begun in 1912, conducted by a faculty from the United States under patronage of the state government, is well attended. The university includes a modern commercial college. There is also a lyceum for girls.

Sucre, soo' kray, the former official capital, was founded in 1539 as La Plata, and later was known as Chuquisaca until 1826, when it was named Sucre, in honor of the first President of the republic. It is the seat of the Supreme Court and the archbishopric of Bolivia. Sucre lies in the midst of picturesque mountain scenery, on a plateau 9,328 feet above sea level, and is situated on a small tributary of the Pilcomayo, 318 miles southeast of La Paz. The population is about 34,000. A railroad connecting Sucre with Potosi was completed in 1928, and automobile roads connect it with other cities. The city was famous in colonial days for its wealth, which was derived from the silver mines in the vicinity, and monuments to its former grandeur are seen in its buildings and institutions. Saint Xavier University, with schools of law, medicine, and theology, founded in 1624, is the oldest institution of its kind in America.

Cochabamba, ko cha bahm' bah, with a population of 35,000, is the capital of the department (province) of the same name. It is situated in a fertile valley, about 8,000 feet above sea level, has wide, regular streets, and carries on considerable trade, especially

in grain. It has a university, two colleges, and secondary schools, including one endowed by American Methodists.

Oruro, o roo' roh, the capital of the department of Oruro, is in a rich tin- and silver-mining district, about 125 miles southeast of La Paz. The state School of Mines is here, and the city has a wireless station. Its location on the Antofagasta & Bolivian Railway has been a large factor in its development. Population, 40,000.

Potosi, poh toh see', located at an altitude of 13,325 feet, is probably the highest city in the world. Its establishment followed the discovery, in 1546, of silver lodes in the vicinity, which for three centuries were the most productive on the globe. It is the capital of the department of Potosi, and now has a population of about 34,000.

Education and Religion. Great impulse has been given in late years to public instruction. Primary education, for the greater part under state or municipal jurisdiction, is carried on by about 1,400 elementary schools. Many of the schools are well provided with desks and other accessories imported largely from the United States. High schools which give training in commerce, mining, and agriculture, and normal colleges for teachers have been established. La Paz, Cochabamba, Oruro, Santa Cruz, and Sucre possess universities. In the American institutes at La Paz and Cochabamba, English

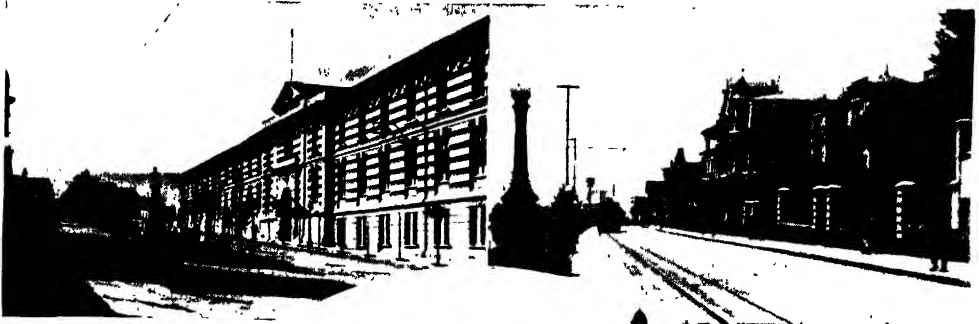


COMPARATIVE AREAS

Bolivia is of uncertain area, but the best authority ranks it nearly equal in size to Idaho, Montana, Wyoming, Utah, and Colorado.

is included in the courses of study. Special schools for Indians are also in operation, where manual training is taught. There are public libraries at all the departmental capitals.

Religiously, Bolivia is Roman Catholic, and most of the Indians as well as the whites belong to this Church, but other faiths are tolerated.



The Land and Its Rivers.

The western part of Bolivia is called, not without reason, the "South American Switzerland," for here two great ranges of the Andes stretch for hundreds of miles, and with their lofty peaks, covered with eternal snow, afford some of the most picturesque scenery to be found in all the western hemisphere. The eastern range, the Cordillera Real, is much the loftier of the two, and contains some giant peaks—Illampu and Illimani, each over 21,000 feet; Todos Santos, 19,500 feet; and Chorolque, 18,500 feet. By far the tallest of the western peaks is Sahama, 21,000 feet high. Between these ranges lies the Bolivian plateau, the region in which the largest cities are located and the most progressive people are to be found. The altitude of this plateau is from 12,000 to 13,000 feet, and a number of small mountain ranges cross it. At its northwestern end, part in Bolivia and part in Peru, is Lake Titicaca, the most elevated large lake in the world. Deep, clear, and icy cold, it lies at an altitude of 12,645 feet, not lower than the summit of Pike's Peak. See TITICACA, LAKE.

Stretching east and northeast from the mountains are the great plains, which slope from a height of 3,000 feet in the foothills to 300 feet at the Brazilian boundary. Very flat and well watered, these plains contain large, grassy tracts, and along the river margins there are dense tropical forests. When the heavy rains set in, much of this eastern region is a great morass, but it is this overflowing of the rivers which makes the soil so fertile and gives promise of future grazing and agricultural de-



SCENES IN LA PAZ

Military college; a residence street; legislative palace; national monument to an aviator, Captain Alarcon. [Pictures from Legation of Bolivia, Washington.]

velopments. Many thousands of wild cattle are found in the rich lowlands in the southeastern sections.

Among the principal rivers of the country are the Beni and the Mamore, which unite to form the Madeira, the largest tributary of the Amazon.

Others are the Itenez, the Madre de Dios, the Guaporé, and the Pilcomayo, which flows into the Paraguay.

Climate. Lying entirely within the tropics, Bolivia is saved by its varying altitudes from a monotonous tropical climate. The plains of the east, it is true, afford just what one might expect in that latitude—intense heat and excessive moisture. In the high mountains is the other extreme of comparatively cold weather, with a yearly average of about 50°; but between the two, in the plateau and mountain basins, lies a temperate region with moderate rainfall and little menace to health. We can therefore account for the fact that the eastern plains are sparsely settled and large districts are yet unexplored.

Animal Life. One of the most characteristic animals of Bolivia is the llama, which roams the mountain regions, and whose importance to the people can scarcely be overestimated.

It is the beast of burden which finds its way over precipitous mountain passes; it yields long, strong wool; and its flesh, though not palatable to Europeans, is eaten freely. The alpaca, armadillo, peccary, tapir, puma, jaguar, and various monkeys flourish; the swampy river banks are the homes of huge alligators; the vulture and condor live in the high mountains; the rhea, the South American ostrich, makes its home in the plains. The forests swarm with brilliant tropic birds, harsh-voiced,

but beautiful. Each animal named above is described in these volumes.

Agriculture. The gradations in the climate cause distinct zones in the plant life, for what flourishes in the hot lowlands will not grow in the cold, clear air of the mountains. In these highest regions, little will grow—no trees, and only such grains as mature very rapidly; but the intermediate districts, the mountain basins, and the eastern slopes of the Andes, produce most of the temperate and subtropic growths. These are almost the only regions which have been really cultivated, and they yield barley, beans, corn, rice, and potatoes (for local consumption), besides coffee and cacao, as well as some tropical fruits.

The great eastern plain, it is believed, contains much exceedingly fertile land, but even

but the development of the mining industry was long hindered by poor transportation and lack of capital. In recent years, railroad construction through the Bolivian high plateau has somewhat remedied this condition; the tin, antimony, wolfram, silver, and copper mines in operation are worked with the latest mining machinery, and tin constitutes Bolivia's most staple and important asset. The country ranks now as the first tin-producing country in the world, and its output represents more than forty per cent of the world production.

Once Bolivia was noted for its gold. A part of that which the Spaniards found decorating the buildings and the apparel of the Incas came from that country; but after the conquest, the mines were not worked until the Spaniards made slaves of the natives and compelled them to labor. Since the country became independent, comparatively little attention has been paid to the mining of gold. There are also undeveloped oil resources.

Transportation. The mountainous character of the most thickly settled part of Bolivia makes excellent roads almost impossible, and to-day, as hundreds of years ago, most of the commerce of the interior is carried on by pack animals. Steep trails lead over the mountains, and long trains of mules or llamas wind their way along them, bringing goods from the central provinces to points that are in touch with the railroads or cart roads that lead to the Pacific. In the western part of the country there are railroads with a length of 1,076 miles. These include the line, opened in 1925, which connects the Bolivian town of Tiepiza with La Quiaca, on the Argentine frontier, thus completing a continuous all-rail route between La Paz and Buenos Aires. The rivers communicating with the Atlantic furnish a possible outlet for the eastern sections, but the distance, and consequently the cost, of transportation is so great that little use is made of them. Construction of about 1,000 miles of automobile roads within the past few years has made possible the introduction of the motor truck.

History. The opening up of Bolivia to Europeans was as romantic as that of Peru, for the former country was a part of the ancient empire of the Incas, about which legend and mystery long centered. In 1538 it was conquered by Pizarro, and Spaniards flocked in to enrich themselves from its mines. They enslaved the natives so thoroughly that not until 1780 was there a serious disturbance.

Bolivia gained its liberty after fifteen years of fighting (see BOLIVAR, SIMON), and in 1825 the first Congress that met at Sucre proclaimed the independence of the country. The first President was General Sucre, one of the most illustrious South American generals and statesmen of the time. Santa Cruz, who succeeded Sucre, initiated the plan of uniting Peru and Bolivia



Photo: Visual Education Service

TYPE OF NATIVE FAMILY

An Aymara Indian, with his wife and baby.

though nearly 5,000,000 acres are under cultivation, agriculture is as yet in a backward condition, and the methods used in cultivating the soil are of the most primitive sort. The wealth of this lowland region lies in its forests. Rubber trees are plentiful, and the occupation of many of the Indians of the forest region is the gathering and transporting of rubber. The peon system prevails here as in Brazil. Crude-rubber exports total annually thousands of tons, and rank next to those of Brazil among South American countries.

Mineral Wealth. Bolivia is rich in minerals,



Photos Visual Education Service

Features of Life in Bolivia. Both pictures show native Indians. Women in the open are weaving a blanket
Below is a class of boys in attendance at a night school.

OUTLINE AND QUESTIONS ON BOLIVIA

Outline

I. Location and Size

- (1) Latitude, $9^{\circ} 34' 50''$ to 22° south
- (2) Longitude, 58° to $69^{\circ} 30'$ west
- (3) Comparative area
- (4) Actual size
 - (a) Reason for uncertainty

- (b) Possibilities of future development
- (c) The peonage system
- (2) Mining
 - (a) Silver and tin
- (3) Transportation
 - (a) Scarcity of good roads
 - (b) Growth of railroads

II. Physical Features

- (1) "The Mountain Republic"
- (2) Plateau
- (3) Great plains
- (4) Rivers and lakes
- (5) Close relation between surface and climate

V. The People

- (1) Proportion of Indians
- (2) Costumes of native women
- (3) Educational and religious condition
- (4) Government
 - (a) Executive
 - (b) Legislature
 - (c) Judiciary
 - (d) Military system

III. Animal Life

- (1) Importance of the llama
- (2) Other animals and birds

IV. Industries and Communication

- (1) Agriculture
 - (a) Relation of crops to altitude

VI. History

- (1) Under Spain
- (2) Independence achieved
- (3) Modern development

Questions

- What are the country's coldest months?
- What may be said of the progress of aviation in Bolivia?
- Name several very tall peaks in the Bolivian Andes.
- Why are there no large cities in the eastern part of the country?
- What is the legal name of the capital city?
- Learn all you can in these volumes about the history of the Incas.
- Why has not the country a tropical climate everywhere?
- Why would you not care to spend a winter in a Bolivian home?
- What effect has the compulsory military system had on the Indians?
- What article that the school children use every day comes from the United States?
- If the Bolivians could keep only one of their native animals, which would they choose? Why?
- What South American country resembles Bolivia in its lack of seacoast?
- If you were transported to the market place of La Paz, what are some of the interesting things that you would look for?
- Why are all the important cities located on the plateau?
- What section of the country promises great development as a grazing region?
- In what respect are the transportation facilities in the most populous section just as they were hundreds of years ago?
- What are the results of recent railroad and highway construction?
- Name possible developments which are necessary for the future welfare and progress of the country.
- Why can there never be in Bolivia an exciting campaign for the reelection of the President?
- In which part of the country are the people most progressive?

under the name of the "Confederacion Peru-Boliviana." He succeeded in occupying Lima, the capital of Peru, but the Chileans and the Peruvian faction opposed to the confederation were successful in deposing Santa Cruz, and



Photo Visual Education Service

HOME OF BOLIVIAN NATIVES

the whole scheme collapsed. In 1880 Chile made war against Peru and Bolivia, and took from them all the coast where are found the saltpeter deposits. In 1930 border warfare was begun with Paraguay over a 10,000-square-mile area adjoining the present border. Each country claims land held by the other.

Other Items of Interest. One of the popular names for the country is the "Mountain Republic." Military aviation has long been in operation in Bolivia, and commercial aviation was established in 1925. A commercial organization owns and operates several air lines operating between Bolivian cities and connecting Bolivia with the Argentine Republic.

June, July, and August are the coldest months, but even then the houses are unheated, the price of fuel being practically prohibitive. As the rooms are very large, often thirty feet long and sixteen feet high, they are far from comfortable.

Bolivia is a land of contrasts. In the market place of La Paz are to be seen llamas from the north with their loads of ice, and mules from the south laden with oranges and tropical fruits.

The electric car line which leads to La Paz was built by Americans.

There are about 4,000 miles of telegraph lines.

The Indians between nineteen and twenty-one years of age who are serving in the army are given not only military drill but a general education, and thus compulsory service is advancing this part of the population very rapidly.

So gay are the native costumes generally worn that someone has compared the market place of La Paz to a "field of poppies in the month of June."

Bolivia has a Boy Scout organization, well uniformed and well equipped.

At Tiahuanacu may be seen the ruins of a city that flourished possibly 3,000 years ago.

Development of Bolivia's abundant water power and the electrification of the country's mines and railways have been pointed to as necessary for the future welfare of the state.

No other country in the world except Northern India has so many mountains of towering height as has Bolivia. E.D.DeM. AND W.W.S.

Related Subjects. The reader interested in Bolivia will find the following articles helpful.

Andes
Bolivar, Simon
Inca
Llama
Madeira River

Peonage
Pizarro, Francisco
Silver
Tin
Titicaca, Lake



Photo: U.S.U.

THE BOLL WEEVIL AT WORK

BOLIVIANO, *bo liv i ah' no*, the standard coin of Bolivia, with a value of about forty cents in American money. See MONEY (Foreign Monetary Standards).

BOLL WEEVIL, *bole we' v'l*, more correctly called **COTTON BOLL WEEVIL**, is a small snout beetle, the most serious insect enemy of the cotton plant. It entered the United States from Mexico, but is native to Central America. Since 1892, when the insect was noticed about Brownsville, Tex., it has steadily made its way over the cotton regions

of the United States until the cotton farms are all infested. In some years it has decreased



the yield of American cotton by about 6,000,000 bales.

Description and Life History. The cotton boll weevil in adult form is a grayish-brown beetle, about a quarter of an inch in length. It has a long snout, or beak, which the female weevil uses to puncture the young flower buds, or squares, of the cotton plant. Within the squares, or within the bolls, if the squares are gone, the eggs are laid. From these eggs, fat, white grubs, or larvae, hatch in three or four days and begin feeding. The infested bolls and squares, the latter of which usually fall to the ground, serve as enclosures in which the larvae pass through the pupal stage and develop into adults. Since only two to three weeks elapse between the egg and adult states, four or five generations may be produced in a season. When the bolls are infested, they become stunted, and their contents are rendered useless.

Methods of Control. In the fall the adult weevils conceal themselves under rubbish or vegetation in the field, by the roadside, in adjoining woods, or in any other protected spot that makes a good winter habitation. Cleaning up the cotton field immediately after the harvest is strongly advised by the United States Department of Agriculture. The following is a specific recommendation:

The field ought to be cleaned in the fall by uprooting the stalks of the old plant, collecting with them the fallen bolls, and burning them. This is a very important step, for it destroys all the insects and larvae that have accumulated there. Then the field ought to be plowed deep in the fall and prepared during the winter for an early crop. This can be done by planting early-maturing varieties, and by fertilizing when necessary.

In addition, near-by weeds and rubbish heaps of all kinds should be cleaned out, that the usual hibernating places may be destroyed. The Department of Agriculture has also introduced a method of applying calcium arsenate dust to infested cotton fields by means of various types of dusting machines. Airplanes are also used. Poison dust does not kill the larvae within the squares, but kills the beetles. See COTTON.

W.J.S.

A Monument to the Boll Weevil. Prior to the spread of the boll weevil, the farmers in the cotton states depended almost entirely on cotton for their money crop. They were thus labeled one-crop farmers. Immediately following the infestation of a locality, and perhaps for several years thereafter, the cotton farmers were mostly bankrupt. Soon, however, they learned to diversify by planting other crops, including corn and peanuts, and by raising

THE DESTRUCTIVE BOLL WEEVIL

Various stages in the life of the pest, and the development of the cotton plant. The sizes of the various illustrations are not proportional. [Drawings by Dr. B. R. Coad, Federal Experiment Station, Tallulah, La.]

cattle, hogs, and chickens, with the result that after a few years, many of the localities were more prosperous than was the case prior to the boll-weevil invasion.

There was a general feeling in the South that diversification was a good thing, and this belief found expression in the erection of a monument in December, 1919, at Enterprise, Ala. There is inscribed on this memorial the following statement:

In profound appreciation of the boll weevil and what it has done as the herald of prosperity, this monument is erected by the citizens of Enterprise, Coffee County, Alabama.

Classification. The scientific name of the cotton boll weevil is *Anthonomus grandis*. It belongs to the order *Coleoptera* (see BEETLE)

BOLLWORM, *bohl' wurm*. See CORN EAR-WORM.

BOLOGNA, *bo lohn' yah*. See ITALY (The Cities).

BOLSHEVIKI, *bol shév' i kie*, the members of the radical Socialist party in Russia. The name was applied originally to the major and radical wing of the Socialist party as constituted in 1903. It means *those of the majority*, though the Bolsheviki, or *Bolshevists*, as they are known in English-speaking countries, have never constituted a majority of the Russian peasants. They came prominently into world affairs in 1917, when, under the leadership of Nikolai Lenin (died 1924) and Leon Trotzky, they overthrew the modern Socialist régime of Kerensky, who had gained control of the government after the abdication of Czar Nicholas II. The Bolsheviki organized the government on the basis of communistic principles, for Bolshevism and communism are essentially the same. The cardinal doctrines of the system are the capture of the means of production and distribution by the proletariat, and the permanent dictatorship of the proletariat. To accomplish their purposes, Lenin and Trotzky used ruthless force, causing the execution of over 1,766,000 persons within a period of five years. The intellectual and middle-class elements suffered especially. The humiliating Treaty of Brest-Litovsk was signed with Germany in 1918, but the subsequent defeat of the Central Powers made the agreement null and void. See WORLD WAR.

To-day the term *bolshevistic* is applied in a general way to any radical scheme or party that urges the overthrow of the capitalistic form of government and the substitution of a rule of the workers. Bolshevistic propaganda has made little headway in America.

Related Subjects. The history of the Bolsheviki in Russia is given more fully in these volumes in the article RUSSIA, while their principles are discussed under COMMUNISM. See, also, LENIN, NIKOLAI, TROTZKY, LEON; SOVIET.

BOMA, *bo' mah*, the chief seaport of Belgian Congo (which see).

BOMB, *bom*, or *bum*, a hollow ball or cylinder, such as a short piece of gas pipe, usually of cast iron or steel, filled with shot and explosive chemicals, which are ignited by a fuse or by a percussion cap. A more ingenious bomb is made with a clockwork attachment which will cause an explosion at a certain time by completing a circuit between two small electric batteries.

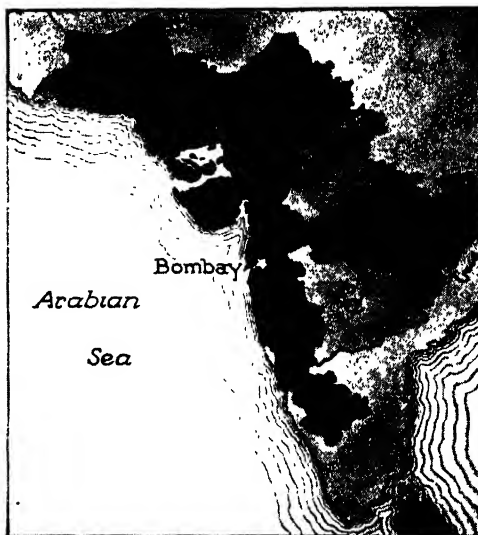
A bomb is popularly regarded to-day as the peculiar weapon of criminal classes, and the name has acquired a sinister meaning as that of a dreaded destroyer of life and property.

In the World War, bombs to be thrown by hand, called *grenades*, were extensively used in trench warfare. See GRENADE.

BOMBARDMENT. See SIEGE.

BOMBAY, the most important seaport on the west coast of India, and the capital of the presidency, or province, of the same name. As a seaport and railway terminus, the city is recognized as the "gateway of India"; as such, it handles a great deal of the commerce of the country. It is sometimes stated that the name is derived from the Portuguese *boom bahia*, meaning *good harbor*, but it really comes from *Bambai Mumba*, the name of a Hindu goddess.

Bombay is the second largest city of India, although famines and plagues have from time



HOMBAY

Location of Bombay presidency, the city of Bombay, and the surrounding presidencies

- | | |
|--------------------------|------------------------------|
| (a) Rajputana | (e) Mysore |
| (b) Central India Agency | (f) Madras |
| (c) Berar Provinces | (g) Baluchistan (not Indian) |
| (d) Hyderabad | |

to time caused great losses in population and wealth. Within recent years, the city has made great progress, materially assisted by harbor

improvements and by its monopoly of the Indian cotton trade.

Approached from the sea, Bombay is said to afford a spectacle rivaling in beauty the bay and city of Naples. The city lies on an island fronting on a magnificent landlocked harbor five miles broad and fourteen miles long. It possesses the finest and most modern buildings of India, and it is one of the oldest of British Indian possessions. To tourists, the most impressive native sight, and one of the most gruesome in the world, are the so-called Towers of Silence, where the Parsee dead are placed, to be devoured by vultures. See **TOWERS OF SILENCE**.

In the bazaars of Bombay mingle representatives of every Eastern race, religion, and language, though the majority of the people are Hindus. The wealthy Parsees (see **PARSEE**), though few in number, dominate native business interests. Education is extended to university training.

Bombay is a great manufacturing center, noted chiefly for its cotton industries, its railway shops, and tanneries. Population, about 1,176,000.

BOMBAY. This presidency, or province, of British India, extends from Baluchistan in a long strip down the western coast, nearly to the southern end of the peninsula. It embraces a total area of about 124,000 square miles. The surface is mountainous, the Western Ghats running parallel to the coast for nearly the entire length of the territory. The principal rivers are the Indus, the Tapti, and the Nerbudda, all flowing into the Arabian Sea. The climate is hot for six months in the year, averaging 95° F. in the shade; during the other six months it is about 10° cooler. The leading agricultural products are cotton, rice, wheat, and millet. Bombay is the largest cotton-producing district of India, and it furnishes nearly one-fourth of the entire crop of the peninsula.

The manufactures are cotton and silk fabrics, leather, and brassware. The commerce is more extensive than that of any other Indian province; large quantities of cotton, tea, sugar, and wool are exported to Great Britain.

The government is in the hands of a governor and an executive council. There is also a legislative council. There are several native states within the territory, each of which is controlled by a chief, who is subject to the governor of the presidency and is assisted by a British agent residing at his court. Population, about 19,500,000, chiefly Hindus. See **INDIA**.

BOMOSEEN, LAKE. See **VERMONT**.

BONA, *bo' nah*, a city in Algeria (which see).

BONA FIDE, *bo' nah fi' de*, a Latin term meaning *in good faith*, used in law in the sense of *honesty*, or *without deception*. A *bona fide* purchaser is a person who buys property and

pays for it, believing that the title to such property is clear and that the owner has the right to sell it. A contract entered into in good faith cannot be annulled without the consent of both parties, but when a contract is shown to be not *bona fide*, the injured person may lawfully cancel it. The term is also used in connection with suits for libel, where a distinction is made between malicious acts and acts done in good faith.

BONANZA, *bo nan' zah*, a Spanish word meaning *fair weather*, or a *favoring wind*, used in mining districts of various countries to signify an abundance of precious metal or rich ore. The word was first given this application by the miners of the Comstock Lode, a gold and silver mine in Nevada which yielded \$340,000,000 worth of ore in thirty years. It is now also used to signify any good fortune or successful enterprise.

BONAPARTE, *bo' na pahrt*, the family name of several characters in history, all deriving their fame from the one outstanding figure of the group—Napoleon, emperor of the French. Bonaparte is the French form of the original Italian name *Buonaparte*, borne by Napoleon's family in Corsica, and by several Italian families prominent in the early Middle Ages. The French spelling was used exclusively by Napoleon after 1796. The Corsican Buonapartes were descendants of Francesco Buonaparte, who went to Corsica from Italy in the middle of the sixteenth century. In the eighteenth century, three male representatives of the family were residing in Ajaccio, capital of Corsica; these were the Archdeacon Lucien Bonaparte, his brother Napoleon, and the nephew of both, Carlo, the father of Napoleon I.

Carlo, or **Charles**, **Bonaparte** (1746-1785), Napoleon's father, completed a law course at the University of Pisa, and after the French conquest of Corsica accepted a government position at Ajaccio. Then he married Letizia Ramolino, a beautiful girl of noble character (in 1764). He fought under Paoli, the Corsican patriot who carried on the vain struggle for independence from French rule, and when he saw that the cause was hopeless, he went over to the side of France. In 1771 Louis XV included the Bonaparte family in the list of those who were to enjoy rank among the French nobility. Of a restless and adventurous disposition, Carlo went to Paris in 1777, where he resided for several years, obtaining free admission for his second son, Napoleon, to the military school of Brienne, where the boy laid the foundation for the career that was to change the destiny of Europe.

Eight children survived him: Joseph, later the king of Spain; Napoleon I, emperor of the French; Lucien, who became Prince of Canino; Maria Anna, afterward called Elisa, Princess of Lucca and Piombino, and later wife of Prince Baccocchi; Louis, whom Napoleon made king of Holland; Carlotta, afterward named Marie Pauline, who married Prince Camillo Borghese; Annunziata, afterward called Caroline, wife of Murat, for a time king of Naples; and Jerome, by Napoleon's decree, king of Westphalia.

Jerome Bonaparte (1784-1860), the youngest brother of Napoleon, after a short European career began an American line of the Bonaparte family by his marriage to Miss Elizabeth Patterson, of Baltimore, in 1803. Having become a lieutenant in the French navy, he was sent on an expedition to the West Indies, and on the outbreak of the war between France and England, in 1803, was forced to run his ship into New York harbor to escape the pursuit of English cruisers. While traveling in the United States, Jerome met Miss Patterson, and married her in spite of his august brother's protests. Two years after their marriage, he separated from his wife at Napoleon's command, and in 1807 was created king of Westphalia, the kingdom erected by Napoleon from conquered German territory. The emperor also forced his brother to marry Catherine, Princess of Württemberg, for he decreed that the queen of Westphalia must be of royal blood.

Jerome's short and troubled reign, in which the state was all but ruined financially, came to an end with the defeat of Napoleon at the Battle of the Nations (Leipzig) in 1813. He was loyal to his brother's cause through all the events that followed, and fought bravely for him at the Battle of Waterloo. Thereafter, until 1847, he lived in various European cities. When his nephew, Louis Napoleon, became President of the French republic established in 1848, Jerome was given charge of the home for disabled soldiers in Paris, and later became marshal of France and president of the Senate.

By his early Baltimore marriage, Jerome had one son, likewise called Jerome, who became the father of Charles Joseph Bonaparte, who was Secretary of War and later Attorney-General in President Roosevelt's Cabinet. Two sons and a daughter were born of the second marriage. The younger son, afterward known as Prince Napoleon, became one of the pretenders to the French throne.

Joseph Bonaparte (1768-1844), the eldest son of Carlo Bonaparte, was closely associated with his brother, the Emperor Napoleon, throughout the latter's period of triumph. He was born in Corsica, and was educated in France. Returning to Corsica in 1785, he studied law, and in 1792 became a member of the administration of Corsica during its brief period of independence. In 1793 he emigrated to Marseilles and married the daughter of a wealthy banker; later, with the rise of his brother to fame after a brilliant campaign in Italy, Joseph began an important public career. Napoleon selected him to conclude a friendly treaty with the United States in 1800, and he later signed the historically famous Treaty of Lunéville and that of Amiens.

In 1806 Napoleon made him king of Naples, and two years after transferred him to Madrid as king of Spain. His position there, entirely dependent on the support of French armies, became almost intolerable; he was twice driven from his capital by the approach

of hostile armies, and the third time, in 1813, he fled, not to return. After the Battle of Waterloo, he went to the United States and lived for a time near Philadelphia, assuming the title of Count of Survilliers. He afterwards went to England, and from there to Italy, where he died.

Louis Bonaparte (1778-1846), the third brother of the Emperor Napoleon and the father of Napoleon III. On completing a course at the artillery school of Châlons, France, he served under Napoleon in the Italian and Egyptian campaigns. In 1802 he married Hortense Beauharnais, Napoleon's stepdaughter, and four years later yielded very reluctantly to his brother's demand that he accept the Dutch crown. It is to the credit of Louis that he tried to rule in the interests of his subjects, and he gave up the throne in 1810 because he thoroughly disapproved of Napoleon's "Continental System," which was most injurious to Dutch commerce. After his abdication, Holland was annexed to France. From that time on, Louis lived chiefly in Rome and in Florence. He was a writer of considerable ability, and he published a novel and several historical works. See CONTINENTAL SYSTEM.

Lucien Bonaparte (1775-1840), Prince of Canino, next younger brother of Napoleon, was an enthusiastic supporter of the people's cause throughout the French Revolution. Having been a disciple of Robespierre, he was imprisoned for a time after the fall of that leader, but was released through Napoleon's influence and in 1798 was settled in Paris as a member of the newly elected Council of Five Hundred. Shortly after Napoleon's return from Egypt, Lucien was elected president of the Council, and in this position saved his brother

by his high-handed dismissal of that body when an attempt was made to pass a vote of outlawry against him. As Napoleon began to develop his system of military despotism, Lucien, who still held to his republican principles and candidly expressed his disapproval of his brother's conduct, fell into disfavor and was sent out of France as ambassador to Spain. Settling finally in Rome, he devoted himself to the arts and sciences, and lived in apparent indifference to the growth of Napoleon's power. He came to France, however, and exerted himself on his brother's behalf, both before and after the Battle of Waterloo. He was a man of literary tastes, his published works including two long poems and an autobiography.

Napoleon Bonaparte. This towering figure in European history, one of the outstanding characters of all time, who crumbled thrones and demolished empires, is described under the title **BONAPARTE, NAPOLEON**, in the article following.

Related Subjects. The reader is referred to these volumes to the following articles:

Continental System	France	Napoleon III
Corsica	French Revolution	Robespierre



CHARLES JOSEPH BONAPARTE

The only American who was descended from the family of the "Little Corsican."



BONAPARTE, NAPOLEON (1769-1821), emperor of the French nation as Napoleon I, was the most dominating individuality and the greatest military genius of his day. At his frown the kings of Europe were ill at ease; against him the whole of Europe was in a perpetual state of war for nearly a score of years. In view of his remarkable career, it is surprising to learn from the French historian and critic, Taine, that Napoleon was disappointing in appearance. In height, he was dwarfed by all who surrounded him, for he was only five feet one inch tall. Lowering brows accorded ill with his weak mouth; his personality lay in his eyes. He was called insignificant by those who had never looked into those eyes.

Early Years. Born at Ajaccio in Corsica, on August 15, 1769, he was the fourth child and second son of Carlo Maria de Buonaparte, as the name was then spelled, and Letizia Ramolino. Both his parents were of aristocratic descent. At the time of his birth, the island of Corsica was passing through a troublous period, and his father had shown ability as a schemer and intriguer in following the policy most likely to benefit himself and his family. On the acquirement of the island by France, the elder Buonaparte secured a nomination for his son Napoleon to the military school of Brienne. After a few months spent in learning the French language, and having already expressed his determination to become a soldier, Napoleon entered the military school, at the age of ten. From Brienne, after a course of education to which he later always referred with contempt, he was transferred to the military school at Paris, where discipline was stern, and education was of a higher order. His scholastic career was not brilliant, and he received his commission in the artillery in 1785 without having given evidence of any marked ability, except perhaps that of holding his own counsel and of carrying through to the end any attitude adopted. These traits, which afterwards made him feared equally in the council chamber and on the battlefield, he inherited from his mother.

On joining the artillery, he was made to perform all the duties of private soldier, corporal, and sergeant before he assumed the rank given him by his commission. Setting himself

to the task of mastering thoroughly the theoretical and practical details of his profession, he devoted much of his time to study; his guiding motive at first appears to have been the patriotic desire of freeing Corsica from the yoke of France. Spending many months on leave of absence in Corsica, he took part in the patriotic movement of Paoli, with whom, however, he was never in full accord.

In 1792 he was again in Paris when the mob attacked the Tuileries, and he received the rank of captain. A quarrel with Paoli in Corsica, in 1793, decided him to throw in his lot



"THE LITTLE CORSIKAN"

Bonaparte at the height of his career. (From a painting by Paul Delaroche.)

completely with the French revolutionary party in the island, and he was forced to take refuge in France. Rejoining the army, he took part in the occupation of Marseilles by the revolutionary forces and marched against Toulon, which, strongly supported by English and Span-



Photo. Visual Education Service

IN EGYPT, ON THE THRESHOLD OF HIS CAREER
(From a painting by Edouard Detaille.)

ish troops, was a great menace to the revolutionary cause. Being practically in command of the artillery at the siege of Toulon, he won golden opinions and promotion to the rank of general of brigade. The fall of Toulon was due to the strategy, power of organization, and concentration of Napoleon, and General du Teil called upon the ministers to "consecrate him to the glory of the republic."

Napoleon's military career practically began at Toulon, after which, in acknowledgment of the ability he displayed, he received the command of the army about to invade Italy. It was about the time of the siege of Toulon that he conceived the idea that was to underlie all his future campaigns, that of concentration against one particular point of the enemy's line. With one point broken or weakened, the army is a chain no stronger than its weakest link. His campaigns at the head of the army in Italy were characterized by many rebuffs, which he met with fortitude. Placed under arrest, charged with disclosing the plans of campaign, his situation was almost desperate. It was a time when men were sent to death on mere suspicion, and no man's life was safe. The commissioners sent by the Convention, suspicious and jealous, yet with not a shred of evidence against him, set him free in time to win a victory against the Austrians at Dego, in 1794; but Napoleon's campaign was canceled, and Scherer was placed in supreme command. Even then he held to his faith in his destiny.

Fame at the Age of Twenty-Six. Again in Paris, poorly clad and ill fed, Napoleon waited for better fortune. The Convention was near-

ing its close, royalist reaction was making headway, and 30,000 National Guards were massed against the Convention, which was protected by Barras. Having seen him at Toulon, Barras nominated Napoleon as his second in command. Napoleon's great chance was at hand. He had one night in which to make preparations to defeat the mob which threatened the Convention. His activity was amazing, his resourcefulness superb. With a "whiff of grapeshot" he cleared the streets of Paris and paved his own road to power. Royalism was defeated, the Convention was dying, and democracy, in the form of the Directory, rose in a night and brought into power the man who in time was to crush democracy and monarchy alike, and centralize world power in one individual. Napoleon's "whiff of grapeshot" made October 5, 1795, a red-letter day in the history of Europe.

Marriage to Josephine. Becoming a member of the Directory, Barras interested himself in the hero of the hour, and it was at his house that Napoleon first met Josephine de Beauharnais, who at once inspired in him a romantic passion. Though penniless, Bonaparte pressed his suit, was strongly supported by Barras, and the marriage was arranged. Josephine seemed afraid of her impetuous wooer, yet was carried beyond herself by his enthusiastic domination. Two days after the marriage, Napoleon set out to take command of the army in Italy. Having previously drawn up a plan of campaign, he submitted it to the Directory, who instructed Scherer, then in command in Italy, to carry it out. Scherer replied that if the Directory wanted that plan of campaign carried out, it

should send the man who drew it up to do so. His suggestion was acted upon. Napoleon arrived in Nice in March, 1796. Naples, Parma, and Modena were forced, by operations culminating at Lodi, to sue for peace. Army after army sent by Austria was crushed; Napoleon carried the war into the enemy's country, and Austria, shorn of the Netherlands and Lombardy, accepted terms of peace at Campo Formio in 1797. Napoleon returned to Paris, a hero, in great favor with the people.

Becomes First Power in France. In days when men eyed their neighbors askance and a leader of the people was to be dreaded, the rise of Napoleon was viewed with disfavor by the Directory. The very men who promoted him now feared the power they had created. An opportunity to get his disturbing personality out of France was eagerly seized. Napoleon's power with the army was now enormous, the devotion of his men amounting almost to worship. To rid the country of him and at the same time to strike a blow at England, the power then most to be feared, he was dispatched to Egypt, where at first he met with his usual brilliant success. The destruction of the French fleet by Lord Nelson, at the Battle of the Nile, in 1798, however, turned the tide of events, and after meeting with varying fortune, Napoleon, prompted by news of the infidelity of Josephine and the intrigues of the Directory, handed over the command to Kleber and returned to Paris. By a bold stroke, he abolished the power of the people who sought to crush him. The Directory ceased to exist; a new constitution was drawn up, with Napoleon as First Consul. The Corsican "corporal" was ruler of France.

It was in 1803, while First Consul, that Napoleon entered into the negotiations with the United States which culminated in the Louisiana Purchase. Being in imperative need of money to carry on his wars, and deciding that the dream of a western empire for France must be abandoned, the First Consul sold to the United States a vast territory covering nearly a million square miles, which is now divided into eighteen states of the American Union.

Successful Against All of Western Europe. Although his government was marked by sagacity and vigor, Napoleon's mind dwelt continually on war and conquest, and it was almost impossible for him to settle down to the arts of peaceful government. His dreams of an eastern empire had been shattered. India, which he had hoped to subdue after Egypt, was beyond his reach. Austria still occupied Northern Italy. A blow, quick and decisive, must be struck. War was his element, and on his armies depended his popularity and his power. In 1800 he conducted a famous march across the Alps, by the Great Saint Bernard Pass, into Italy. At Marengo, the Austrian

army was confronted, and Napoleon would have been annihilated but for the timely arrival of Desaix and Kellerman with reinforcements, which changed a rout into a victory. Austria was again defeated at Hohenlinden, on December 2, 1800, and terms of peace were arranged and signed by Joseph Bonaparte at Lunéville, in February, 1801.

England was then France's only remaining active enemy. France was compelled to evacuate Egypt; Malta was retaken by the English. The Treaty of Amiens, signed by Cornwallis for England, and by Joseph Bonaparte for France, on March 27, 1802, gave France its first real peace in ten years. Spain, Naples, Bavaria, Portugal, Russia, Turkey, and finally, England, had all been forced into treaties directed by the fallow, undersized Corsican. In all these treaties were buried the seeds of future wars, carefully sown by the master mind



Photo: Visual Education Service

THE CORONATION

"He snatched the crown from the hand of the Pope."
(From a painting by David.)

of Napoleon, seeds that were shortly to grow like dragon's teeth into armies beneath whose tread Europe must again tremble.

Becomes Emperor. Not satisfied with the appointment of Consul for life, which had been conferred on him by a unanimous vote of the people, Napoleon began to dispense with any governmental form and power except that vested in himself, and, being offered the title of Emperor by the Senate, he was crowned as Emperor Napoleon I, on December 2, 1804, in

the presence of Pope Pius VII. It is said that, being impatient, he snatched the crown from the Pope's hand and, placing it on his own head, ordered the Pope to proceed quickly with the ceremony.

[An illustration of the crowning of Josephine appears in an article under her name in these volumes.]

While Napoleon's life is best known for its military side, yet he ruled the internal affairs of France as personally as he guided its armies. His Code Napoleon, a system of laws promulgated under his order, was a concise outline of judicial procedure. He also did much to encourage elementary education.

Begins to Dominate Europe. Napoleon, like Caesar of old, had cast longing eyes at England, and now planned its invasion. War broke out in 1803, and the emperor prepared to put his plan into execution. Russia, Austria, and Sweden uniting with Great Britain, Napoleon was forced to use his "army of invasion" to crush the continental opposition, rather than to subdue the "nation of shopkeepers," as he described the English. Mack, the Austrian general, was compelled to surrender at Ulm (1805). In the same year, Napoleon entered Vienna, and a month later he completely routed the Russian and Austrian armies at Austerlitz; this was one of the most brilliant victories of his whole career. Meanwhile, Nelson, by his great victory at Trafalgar, had completely established the supremacy of England at sea.

Napoleon now set himself to order the affairs of the territories that had come into his hands. He was a believer in the theory that "the object of war is victory; of victory, conquest; and the object of conquest is occupation," and he proceeded to change the map of Europe to his liking. Britannia might rule the waves, but on land the whole of Europe bowed to the will of Napoleon, backed by his artillery. His brother, Joseph Bonaparte, was made king of Naples; another brother, Louis Bonaparte, was declared king of Holland; districts of Germany and Italy were created into principalities and dukedoms and were distributed among the emperor's favorite, or most successful, generals. This arbitrary proceeding brought about further war with Prussia. But the star of Napoleon was still in the ascendant, and the year 1806 brought more glory to France and deeper degradation to Prussia. The battles of Jena and Auerstadt opened the way to Berlin, where Napoleon as a conqueror issued the Berlin Decree, instituting the Continental System, which completely isolated England.

Advancing against the Russians, he met with disaster at Poltusk and Eylau, but quickly recovering, inflicted a crushing defeat on the Russian army at Friedland, in the summer of 1807, and the czar was compelled to sue for peace. By the Peace of Tilsit, Prussia received back about half of its dominions, and Russia

agreed to close its ports against all British trade. Jerome, a younger brother of Napoleon, was made king of Westphalia; Warsaw was created a duchy and given to the king of Saxony; whole provinces were divided, and new ones were created at the whim of the mighty conqueror.

Still there were other regions open to the thunder of Napoleon's armies. Portugal had not obeyed the Berlin Decree. Dispatched with a large army of invasion, Junot occupied Lisbon. The affairs of Spain were badly managed;



Photo: Visual Education Service

NAPOLEON IN 1814

(From a painting by Meissonier.)

Murat was sent to Madrid, and Charles IV was dethroned. Joseph Bonaparte was not contented with Naples. Here was the throne of Spain ready for his occupation—Murat should take Naples as his share of the plunder. So Napoleon juggled with thrones and kingdoms. Europe was outraged, but lay silent and sullen beneath the guns of the conqueror. England, recovering from its stupor, realized the menace in the figure of the emperor who was looking across the narrow English Channel, waiting an opportunity to strike. Spain was in arms, and needed help to drive out the usurper. Thus began the Peninsular War, which lasted seven years. Meanwhile, Austria had again declared war, and it raised an army under the Archduke Charles. Napoleon encountered him. It was a case of Caesar's "I came, I saw, I conquered," over again. At Eckmühl, the Austrians were routed. Himself defeated at Aspern and Esling, the later victory at Wagram (1809) enabled the invincible Corsican again to enter Vienna as a conqueror and dictate terms of peace.

Returning to Paris, he cruelly divorced Josephine, who had borne him no children, and



Photo: Visual Education Service

THE CONQUEROR BEFORE THE EGYPTIAN SPHINX

Literature is full of allusions to the incident of the rising genius of his age as he sat silent and motionless before the imposing figure. It has been the conceit of writers to wonder what questions as to his future Napoleon would have liked the Sphinx to answer. (From a painting by Gérôme.)

soon afterwards married the Archduchess Maria Louise of Austria, who bore him one son. This alliance strengthened his connections in mid-Europe. The principal object of Napoleon was now to crush the disturbance in Spain, and to this he devoted the chief power of his mighty armies. Only in the Peninsula was England directly responsible for operations against Napoleon, but Britain liberally subsidized other movements, and its ships seized French colonies wherever possible. In the Peninsula, the armies of France were meeting with reverses, and were slowly, but surely, driven out of the country.

Disaster in Russia. Russia had been unable literally to carry out the behests of the Berlin Decree. In 1812 Napoleon declared war, and he invaded Russia with an army of nearly 600,000 men. The Russians had learned wisdom, and would not face the invaders. Retiring step by step, laying waste the country as they went, they led the French into the interior. At Borodino and elsewhere, the avalanche of French overwhelmed Russian resistance. Napoleon pushed on to Moscow, only to find the city in flames and behind him a country utterly devastated. It has been claimed that the weary march back began the breaking up of that mighty intellect which had ruled Europe so long. What war could not do to the army of the "Little Corporal" the piercing cold and famine on the plains of Russia accomplished. Swarms of Cossacks hung like

jackals on its flanks; the weakened veterans, heroes of numberless battles, succumbed to cold and disease, and of that gallant army of 600,000, only about 25,000 left the country.

It was the beginning of the end for Napoleon. Leaving Murat in command, he hastened to Paris to organize a fresh army before the news of his terrible disaster could reach Western Europe. But his prestige was gone. England and Russia at once assumed the direction of the destinies of Europe.

Coalition Against France. Prussia, Russia, Sweden, and Spain were roused, and they joined Great Britain against Napoleon. The allies were defeated at Lützen, Bautzen, and Dresden, but they were able to reenforce their armies, while Napoleon was fighting with the total remnant of his strength. Disaster overtook him at Leipzig, and in the "Battle of the Nations," October, 1813, he was completely defeated. Raising with herculean efforts a new army, he confronted the allied hosts from January to March, 1814. The Duke of Wellington was advancing on Paris from the south. Napoleon was outnumbered; his prestige was gone; his trusted veterans had been left amid Russian snows; he had but an army of recruits to depend on.

Elba, Waterloo, Then Saint Helena. In April, 1814, Napoleon abdicated. With the title of emperor and six million francs, he retired to the island of Elba, and Europe breathed freely—only for ten months, however. Escaping

from Elba, Napoleon, everywhere joined by old followers, made a triumphal entry into Paris, and the allied armies once more took the field against him. This was the period of the historic Hundred Days. On June 16, 1815, he defeated Blücher at Ligny, while Marshal Ney, who had joined him after declaring he ought to be kept in an iron cage, fought the British at Quatre Bras, under Wellington, who fell back on Waterloo. On June 18 he was attacked at Waterloo by Napoleon, whose army was totally defeated in the most decisive battle of modern times, up to the days of the World War. Fleeing to Paris, Napoleon again abdicated, and tried to escape from France. Failing in this, he surrendered to the captain of a British man-of-war, who took him to England, nominally a guest, in reality a prisoner. He was then conveyed to Saint Helena, a forbidding, desolate island in the Atlantic, off the west coast of Africa. All the world feared to have him free.

In solitude, under the care of a stern, harsh British governor, he spent the remainder of his days. He died a victim of cancer on May 5, 1821, and was buried in the island; but in 1840 his remains were disinterred and conveyed to Paris. They now repose beneath the dome of the *Hôtel des Invalides*, the hospital for aged and infirm soldiers.

Related Subjects. The following articles in these volumes will give added information on the subject of Napoleon and will make clear certain references above

Austerlitz	Louisiana Purchase
Barras, Count de	Lützen, Battles of
Bonaparte (preceding article)	Marengo, Battle of
Code Napoleon	Maria Louisa
Continental System	Murat, Joachim
Corsica	Nelson, Horatio
Directory	Ney, Marshal
Elba	Reichstadt, Duke of
France (History)	Saint Helena
French Revolution	Trafalgar
Germany	Tuileries
Josephine, Marie Rose	Waterloo, Battle of
Leipzig, Battles of	Wellington, Duke of

BOND, a word of many meanings, but most commonly applied to a special form of contract—a written or printed evidence of debt issued by a government or a corporation, usually for the purpose of borrowing money. The name is given to any obligations issued in a group and bearing a fixed rate of interest, provided they are under seal. If the evidence of debt is merely a promise to pay, not under seal, it is a promissory note, not a bond.

If you buy a bond of \$1,000 denomination which is a part of an issue for a loan of \$100,000, you provide a hundredth part of the entire loan. Such a loan is divided into small parts, each representing \$100, \$500, or \$1,000, to make it possible for many people of moderate means to acquire a portion of it. This plan of selling small amounts of a bond issue to many people makes it possible to borrow vast sums.

Mortgage and Debenture Bonds. Bonds are of two kinds, *mortgage* and *debenture*. A *mortgage* bond, as the name indicates, is a direct lien on the assets of the company, or on a specially designated part of the assets. A railroad, for example, may issue general mortgage bonds based on its entire assets, or it may issue bonds whose security represents the property on only a branch line or a certain division. A *debenture* bond, on the other hand, is merely a promissory note under seal, and has no characteristics of a mortgage. If the corporation fails to pay the interest or principal, the holders of mortgage bonds may bring foreclosure suit; the holders of debenture bonds are merely creditors who may share in the assets.

Theoretically and legally, there is no limit to the number of bond issues which a corporation may issue. It has power to issue first- and second-, or even third-mortgage bonds. It may have all of these, and also several issues of debenture bonds. Mortgage bonds are usually for longer periods, varying from twenty to ninety-nine years, and bring a moderate return—four to six per cent is the average. Debenture bonds, being merely promissory notes, require fewer legal preliminaries, and are usually issued when a corporation desires to borrow money for a short period of years. The rate of interest on such short-time loans is usually higher than on long-time mortgages.

Bonds issued by governments are not based on a mortgage as security, but merely on the apparent ability and intention of the government to repay their face value. If the government of the United States or of Canada should refuse to redeem its bonds, that is, should *repudiate* them, the holders would have no redress. In the past, a number of the states have repudiated their bonded debts, or have compromised with their creditors. While repudiation is still possible, in the United States and Canada the issue of bonds is so carefully controlled by statute that the bonds of a state or province, or any of its divisions, are a safe investment.

Registered and Coupon Bonds. Advertisements of bond issues frequently state that "these bonds are sold with the privilege of registry." This means that the owner's name, the serial number of the bonds, and the total amount held by each owner are registered on the company's books. The interest and principal are payable only to the person whose name is registered; in this way, the holder is protected from loss or theft. Registered bonds may be transferred by giving proper notice to the secretary, who makes the necessary changes in the register.

Coupon bonds have certificates of interest, or *coupons*, attached to the bond; these state the exact amounts of interest due, and dates

when due. The coupons are cut off on the interest date, and are presented for payment. Any bank, on receipt of a coupon, will usually cash the coupon for its customers, and will in turn collect from the corporation which issued the bonds.

The difference between registered and coupon bonds is merely in the form. It does not in any way affect the character of the security. A mortgage bond may be either registered or coupon; so, too, may a debenture bond.

Bonds as Investments. The popularity of bonds is easily explained. In the first place, they give a corporation an opportunity to borrow money without giving outsiders a voice in the management of the business, for the owner of a bond does not become a stockholder; he is merely a creditor. If the corporation is being mismanaged, the bondholders have the power to protect their interests through legal processes.

In the second place, the safety of bonds appeals to investors. Not all bonds, of course, are safe; the bonds of a company which has no assets are as worthless as its stock. In all cases, however, the bondholders are preferred creditors, and bonds are the first obligations of a company. No dividends can be paid on either common or preferred stock until the interest on the outstanding bonds has been earned and paid. In good business years, the capital stock of a company may earn large dividends, but if business is poor there may be no dividends. Bonds pay a smaller, fixed rate of interest, but a company must be close to bankruptcy if it cannot pay interest on its bonds. If the bond interest is not paid, it is said to be *defaulted*.

To say which class of bonds is the safest is a difficult, if not impossible, task. As a rule, the bonds of national governments are the safest, and for that reason these pay the lowest rate of interest. The bonds of Haiti, Nicaragua, or any other country with an unstable government, are not always safe; they have occasionally been repudiated, and may be repudiated again. The bonds of states, provinces, counties, townships, and school districts form a second class, normally just as safe as the first class. Third in preference should come the bonds issued by large corporations whose conservative management is known, and whose semi-public character makes secret manipulation practically impossible. Such corporations include the large railway systems and most public-service corporations. Their bonds are usually listed on the stock exchange, but the market prices must not always be accepted as a fair index of the value of the bond.

A fourth class of bonds would include those issued by smaller companies, many of which are probably as sound financially as the larger ones. Independent investigation, however, is advisable in every case. If the intending

investor is not in a position to learn the facts for himself, he should ask the advice of a reputable banker or broker.

Market Prices. Many bond issues, particularly if the issue or the company is a large one, are listed on the stock exchange. In such case, the quotations of sales furnish a fairly adequate test of the value of a bond. Bonds are nearly always quoted on a basis of \$100 par value. For example, if the quotation is 97½, this means that a bond whose face value is \$100 is being sold for \$97.50. If the market price falls far below par, it is a fairly sure sign that the bond is not a good one for the conservative investor to hold. It is customary in the market to designate each bond issue by a short abbreviation which identifies the bond; for example, "Bethlehem Steel 1st 5s" means first mortgage bonds, drawing five per cent interest, issued by the Bethlehem Steel Company; "Panama 2s 44" means a bond drawing two per cent interest, principal due in 1944, issued by the Republic of Panama. If the quotation reads "Panama 2s 44, 99 bid," it means that somebody has offered \$99 for a \$100 bond issued by Panama and due in 1944.

Other Meanings of the Word "Bond." The words *bond*, *bind*, and *band* all come from the same root, and originally had the same meaning, that is, a *fastening*. In a figurative sense, there was a fastening between two people who made any kind of a contract; and in law today a bond is any contract under seal by which a person agrees to do or not to do a thing. More specifically, a bond involves the payment of money; any other contract is usually called a *covenant*.

Bonds may be *simple* or *conditional*. A simple bond is a definite promise to pay. On the other hand, a bond may involve a condition. A bank cashier, for example, furnishes a bond to his employers; that is, an individual or a company agrees to make good the bank's loss if the cashier steals any of its money. A bondsman may agree to pay the court a certain amount if an accused prisoner for whom his bond is sponsor is not on hand when his case is called for trial. Such a prisoner is said to be out on *bail*, and the bond given to insure his appearance is a *bail bond*. Goods which are liable to customs duties or internal revenue taxes are said to be *in bond* when they are placed in storage under a bond that they will not be removed until the duty or tax on them is paid. This is the meaning of the phrases "bottled in bond" and "imported in bond." Such storage houses are called *bonded warehouses*.

F.H.E.

Related Subjects. The following topics will be found helpful by the reader interested in bonds:

Bail	Interest
Bonded Warehouse	Mortgage
Commercial Paper	Stock Exchange

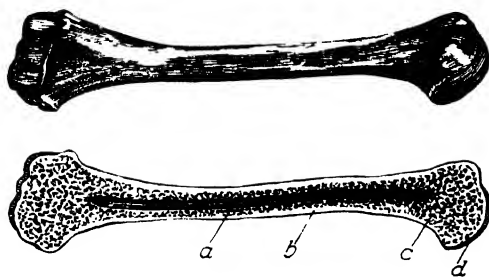
BOND, CARRIE JACOBS (1862-), an American musical composer whose songs have enjoyed wide popularity because of their attractive words and lilting melody. Carrie Jacobs was born in Janesville, Wis., and was educated in the public schools there. In 1887 she married Dr. Frank L. Bond, who died in 1895. She supported herself and her son by her musical compositions, and subsequently organized, with him, the publishing firm of C. J. Bond & Company, becoming its president. Mrs. Bond has made her home in Southern California for several years.

Her Songs. Of the individual songs written by Mrs. Bond, the best loved are *A Perfect Day*, *Just A-wearyin' for You*, and *I Love You Truly*. Others include *Little Pink Rose*, *O Haunting Memory*, *God Remembers When the World Forgets*, and *To-day*.

BONDED WAREHOUSE, a warehouse maintained or controlled by a government for storage of goods on which duty is levied, the goods to be held until the time when the owners call for them. This system has been found a great convenience to merchants, as it enables them to pay duty by installments, removing the bonded goods in such quantities as may be required from time to time. Goods of domestic manufacture, on which internal-revenue taxes are levied, may be stored in the same way. While in bond, the goods may be made ready for sale by the manufacturer or merchant, under supervision of government inspectors, who must see that nothing dutiable is removed from the warehouse until due payments have been made.

F.H.E.

BONE, the hard substance that forms the framework of the bodies of man and other vertebrate (backboned) animals. The individual sections of this framework are known



BONE AND LONGITUDINAL SECTION

(a) Marrow cavity; (b) hard substance; (c) spongy bone; (d) cartilage.

as *bones*, and the framework, considered as a whole, is called the *skeleton*. In the human body, it is made up of about 200 separate pieces.

The functions of the bones are to give the body definite shape, to protect from injury the more important delicate organs, and to afford

attachment for the muscles. There is another extremely important process associated with certain of the bones—the formation of all of the red cells and some of the white cells of the blood. This process is located in the red marrow of the ribs, and also in the heads of the long bones.

Classes of Bones. Bones are divisible, in regard to form, into four classes: long, short, flat, and irregular. The long bones, found in the limbs, form a system of levers which, with the muscles attached to them, provide the means of prehension (grasping) and locomotion. The short bones, illustrated by those of the foot and wrist, are found mainly where compactness, elasticity, and limited motion are the principal requirements. Flat bones confer protection and provide hard surfaces for muscular attachment, as in the case of the bones of the head and the shoulder blade. Lastly, irregular bones constitute a group of peculiar form, often very complex, such as the vertebrae, coccyx, and many of the bones of the skull.

Composition of Bone. About two-thirds of the composition of bony tissue is mineral matter, chiefly calcium phosphate. The remainder is animal matter, consisting largely of a form of gelatin. If a bone is soaked for two or three days in a weak acid, the mineral matter will dissolve, and the animal matter remaining can be bent into almost any shape. If bones are burned, the animal matter is destroyed, leaving the mineral matter. Burnt bone is very brittle, and is easily ground into powder. Bones are sometimes called the “petrified” organs of the body, because they have been slowly changed from cartilage in the embryo into a sort of porous limestone as the body reaches maturity. In old age, the excess of mineral matter makes the bones brittle and slow to heal when broken. In childhood they contain only a small portion of mineral matter, and are not easily broken or injured by falls; this is why children suffer few severe injuries. On the other hand, children's bones may easily be bent or otherwise deformed by lack of exercise or by keeping the body too long confined in one position. Lack of proper nourishment for young children sometimes causes a softening of the bones; this disease is called rickets.

Structure of the Bones. The bones consist of two kinds of tissue, known as *compact* and *cancellous*. The former is the hard, densely textured exterior portion; the latter, the spongy part on the inside. This interior tissue is called cancellous (meaning *covered with bars*) because it is like a lattice or network in structure. The position and amount of these tissues in any bone vary according to the purpose for which the bone is intended. In long bones, the spongy tissue is found at the rounded

ends, where the articulation of joints occurs. In certain parts of the skull, the spongy tissue is replaced by the air-filled cavities called *paranasal sinuses*. Bones are invested with a fibrous membrane, the *periosteum*, by means of which blood vessels are conveyed to them.

The dense shafts of long bones are hollow, and the interior forms a cylindrical canal, the *medullary cavity*, which is filled with yellow marrow. This substance is a network of connective tissue, permeated with blood vessels. In the meshes of the network are various kinds of nutritive cells; the marrow, in fact, contains a rich store of proteids, fats, and iron compounds. The bony tissue of the long bones is supplied with blood from a nutrient artery, the small branches of which are conveyed through the *Haversian canals*. The bone is also believed to be nourished by lymph, which is carried through a system of channels found in the spaces outside the Haversian canals. Nerves are also present in bone tissue.

Broken Bones. When a bone is broken, it should at once be "set," that is, put in its proper position; then the joined ends should be so fastened that they cannot move upon each other. They will then grow together and in a few weeks, ordinarily, the bone will be as good as ever.

Used as Fertilizer. The mineral matter in bones makes excellent fertilizer. The animal matter is first removed by burning the bones, or by boiling them; either process accomplishes the desired result, but by boiling less of the mineral matter is lost. The bones are then ground to powder, and the latter is treated by chemical processes to make all the contained minerals soluble in water. K.A.E.

Related Subjects. The following articles will be found interesting and helpful in connection with this topic

Arm	Fracture
Boneblack	Hand
Carrel, Alexis	Joints
Cartilage	Pelvis
Embryo and Embryology	Rickets
Fertilizer	Skeleton
Foot	Tendons

BONEBLACK, OR ANIMAL CHARCOAL, is the charcoal obtained by heating bones in closed iron retorts until the animal matter is burned. The bones are reduced to small, coarse grains; these are then ground to a fine powder, which forms the boneblack of commerce. Boneblack will absorb the coloring of liquids that pass through it; consequently, it is extensively used in refining sugar and in removing the coloring matter from syrup (see SUGAR). It will also absorb odors, and is sometimes used to remove disagreeable smells from clothing and houses. Boneblack is added to certain pigments to produce a high-grade plate ink, and a mixture of boneblack and oil is used in making paint. T.B.J.

Ivory Black. Waste ivory chips, when heated in closed retorts, produce a black pigment called *ivory black*. This term is also sometimes used for boneblack of fine quality.

BONESET, OR THOROUGHWORT, *thoroughwort*, a medicinal plant of the composite family, which grows wild in meadows and lowlands of the United States and Canada. It is easily recognized by its stem, four or five feet in height, which passes through the middle of a large double, hairy leaf; and especially by its rayless flower heads in loose, flat tops. Boneset is about the only white blossom which appears among the gay, late summer colors. Boneset tea, brewed from the shoots, is used to allay fever and induce perspiration, and is also valued as a tonic, a cathartic, and an emetic. The name *boneset* refers to the reputed efficacy of the medicine in "setting the bones" in cases of fever. The close union of the opposite leaves suggested the name *thoroughwort*. B.M.D.

Scientific Name. Boneset belongs to the family *Compositae*. Its botanical name is *Eupatorium perfoliatum*.

BONET, *bo na'*, JUAN, pioneer in education of the deaf and dumb. See DEAF AND DUMB (The Education of Deaf-Mutes).

BONHEUR, *bo nur'*, ROSA (1822-1899), a famous French artist, whose spirited reproductions of animal life have given her repute as the greatest woman painter of animals. She was baptized Marie Rosalie, but has always been known as Rosa. She painted from early girlhood. When she was nineteen years of age, her *Rabbits Eating Carrots* was displayed in the annual Paris exhibition known as the *Salon*. Thereafter until 1855, her pictures were exhibited each year, and in 1848 she was awarded a medal of the first class. In 1865 Empress Eugénie honored her with the cross of the Legion of Honor.

In order to study animals at close range, she practiced for a time in various slaughterhouses on the outskirts of Paris. Her canvases are remarkable for the truthfulness shown in the representation not only of the animals painted, but of the landscape setting of the pictures. The drawing and composition are likewise excellent, but the color is somewhat hard, and she was only moderately successful in giving her pictures an effective atmosphere.



Photo: Brown Bros
ROSA BONHEUR



REPRODUCTION OF BONHOMME RICHARD'S GREAT PAINTING, THE "HORSE FAIR"

Her Paintings. Possibly the most admired of her canvases is the great *Horse Fair*, which gives an extraordinary representation of struggle and action. This was bought by Cornelius Vanderbilt for \$55,000 and presented to the Metropolitan Museum of Art, New York City, where it now hangs. *Plowing in the Nivernais*, one of her best pictures, is now in the Louvre, Paris, which also possesses her *Haymaking Season in Auvergne*. The *Deer in the Forest*, *A Limier-Briquet Hound*, and *Weaning the Calves* are in the Metropolitan Museum, and her *Deer Drinking* is in the New York Public Library.

BON HOMME RICHARD, *bo nom' re-shahr'*. See JONES, JOHN PAUL.

BONIFACE, the name of nine Popes, three of whom are of special historic importance.

Boniface II (530-532) was the first Pope to assume the title of Universal Bishop of Christendom, the head of the Church having been known up to that time as Bishop of Rome.

Boniface VIII (1294-1303) was the most famous Pope bearing the name. Two edicts showed clearly his opinion as to the place the Church should hold in the life of the day. The first of these was the *Clericis Laicos*, issued in 1296, which forbade the payment or collection of taxes on Church property without the consent of the Holy See; the second was the *Unam Sanctam*, which declared that those who did not hold the spiritual power of the Church superior to any merely temporal power were maintaining false doctrine, dangerous to salvation. His attempts to assert the Papal supremacy in France led to contests with King Philip the Fair, during the course of which Boniface was arrested and imprisoned.

Boniface IX (1389-1404) bent all his energy to strengthening Papal authority, and succeeded in making himself almost absolute in Rome. Outside of the city, however, he met with firm opposition, and was obliged to make concessions.

G.W.M.

BONIFACE, SAINT (680-755), a celebrated English missionary, whose labors among the heathen tribes of Germany have been perpetuated in his title, the *Apostle of Germany*. He was born at Kirton, Devonshire, of a noble Anglo-Saxon family, and received in baptism the name Winfrid. In 718 Pope

Gregory II called him to preach the Gospel to the German tribes, and for three years he labored among them, seeing multitudes converted through his preaching.

The Pope appointed him bishop in 722, and gave him the name of Boniface. About 743 he founded the Abbey of Fulda, which became one of the most famous monasteries in Germany, and for ten years, beginning in 744, he was archbishop of Mainz. He is said to have enforced his missionary teaching by cutting down, with his own hands, an oak at Geismar which was sacred to the pagan gods. The festival of Saint Boniface is celebrated in both the Roman and Anglican churches on June 5, the anniversary of the day on which he met his death at the hands of a mob. See MISSIONS AND MISSIONARIES.

G.W.M.

BONN. See GERMANY (Principal Cities).

BONNET ROUGE, *bo neh' roozh*. See LIBERTY CAP.

BONUS FOR SOLDIERS. See SOLDIERS' BONUS.

BOOBY, the name given by sailors to certain species of gannet (which see), because of their habit of alighting on ships and submitting to capture by hand. Actually, boobies are as intelligent as most sea birds, and their seeming stupidity is probably due to their lack of instinctive fear of man. They are found in tropical and subtropical regions, and they nest on deserted islands near the shore. Two greenish-blue eggs, covered with a chalky deposit, are laid. Boobies feed on fishes, which they catch by diving. These birds are about the size of gulls, and have heavy bodies, long wings, and long, pointed bills, but are without nostrils. The lower jaw, chin, and throat are naked, and are variously colored. Two species are sometimes found on the southern coasts of the United States, the brown and white *common booby* and the *red-footed booby*; the latter is a bird with white body and black wings.

D.L.

Scientific Names. Boobies belong to the family *Sulidae*. The common booby is *Sula leucogastra*; the red-footed, *S. piscator*.

BOOKKEEPING. Did you ever keep the score of a ball game by cutting notches on a stick? If you did, you did not think of it as bookkeeping, and yet it was in a very similar manner that the first business accounts were kept. Indeed, it is only a few hundred years since the Chancellor of the Exchequer, the treasurer of the funds of the British government, recorded all his transactions on tallies, or notched sticks, and it is about a century since the tally ceased to be part of the official bookkeeping of the British nation.

Everyone should have some knowledge of bookkeeping. Most people would like to be able to keep accounts for themselves and to understand the accounts of others, but many are deterred by the belief that the subject is complicated and the work difficult. In reality, modern bookkeeping is nearly as simple as notching sticks, though the process is longer. This does not mean that it is easy for a farmer to comprehend the account books of a factory, or for a housekeeper to understand the records of a large corporation. But it does mean that a farmer may easily keep books for his farm, and a housekeeper for her house-

hold. Of course, the books can be made complicated, but they do not have to be.

One valuable service of good bookkeeping is the help it gives in planning for the future. Is it wise for the storekeeper to spend more money on advertising? Will he be able to pay the rent demanded in a more central location? Will it pay the farmer to buy a gasoline tractor, or should he continue to use horses? Will it be worth while for the housekeeper to continue taking boarders, or would it be more profitable for her to spend her extra time in baking goods for sale? Does the manufacturer make a profit on all articles, or are some actually sold at a loss? Does the grocer know whether his profits for the year exceed the cost of the groceries withdrawn for his family's use? All such questions cannot properly be answered by people who do not keep accounts, or who keep them with little regard to scientific principles.

Bookkeeping is the recording phase, or division, of accounting, and it may be defined as the making of systematic records of business transactions so that the condition of a business may be determined from them. Although there are two systems of bookkeeping, double entry and single entry, double-entry bookkeeping is considered by far the more satisfactory, and it is generally used in all lines of business.

Double-Entry Bookkeeping

The Venetians of the fifteenth century are usually credited with having invented the double-entry system, but it is quite probable that they merely elaborated and made popular methods that had been used by the ancient Romans. It is certain that from that time down to the present, business men in the leading commercial countries of the world have kept their records upon a double-entry basis—a basis which allows of proof, analysis, and interpretation.

The basic principle of double-entry bookkeeping is that every business transaction consists of a value received and a value parted with, and that both these values must be recorded.

To illustrate, if you paid \$4 for a pair of skates, you received the skates worth \$4, and you parted with \$4 cash. The value received was the pair of skates; the value parted with was the cash.

Again, if your father sold John Jones a hat for \$5, your father received cash, \$5, and he parted with the hat, worth \$5. The value received was the cash; the value parted with was the hat.

Values received are called *debits*; values parted with are called *credits*. *Debit* and *Credit* are the two words which designate the elements, or opposite sides, of each transaction.

The goods bought and sold by a store are generally referred to as *merchandise*; thus, the suits, overcoats, shirts, ties, hats, etc., bought and sold in a clothing store, are called *merchandise*. Merchandise purchased by a merchant is referred to as *Merchandise Purchases*; merchandise sold by a merchant, as *Merchandise Sales*. The storekeeper may buy his merchandise for cash, or he may promise to pay for it at some future time. Thus, John Kramer, the storekeeper, on January 27 may buy from Olson & Company 3 suits at \$17.50 each, and promise to pay for them within 30 days. This means the suits were purchased *on account*; Olson & Company received the promise of John Kramer to pay for the suits within 30 days, and they parted with the merchandise.

The person who owes a debt is called a *debtor*; *debit* in Latin means *he owes*. In the sale of the suits to John Kramer by Olson & Company, it is plain that John Kramer owes Olson & Company for them, so Olson & Company will debit *John Kramer* \$52.50 and credit *Merchandise Sales* \$52.50.

The person to whom a debt is owed is called a *creditor*; *credit* is Latin for *he entrusts*. Thus, in the purchase of the suits from Olson & Company by John Kramer, it is clear that Olson & Company entrusted Mr. Kramer to

pay within 30 days for the merchandise purchased, so John Kramer will debit *Merchandise Purchases* \$52.50, and credit Olson & Company \$52.50.

When a debtor makes a partial payment of the total amount due a creditor, the payment is called a payment *on account*; if the payment is for the entire amount owed, it is called a payment *in full of account*. Thus, if Mr. Kramer paid Olson & Company \$25 on February 6, it would be a payment on account; if he paid him \$52.50, it would be a payment in full of account. In either transaction, Mr. Kramer would debit Olson & Company for the amount paid them, because he was released for that amount from the debt for which they entrusted him. Mr. Kramer would credit *Cash* in either transaction for the proper amount.

When a creditor makes a partial payment of the total amount due a debtor, the cash received is called a *receipt on account*; if the receipt is for the entire amount owed, it is called a receipt *in full of account*. Thus, from the standpoint of Olson & Company, a receipt of \$25 would be a receipt on account; the receipt of \$52.50 would be a receipt in full of account. In either transaction, Olson & Company would debit *Cash* for the proper amount, and would credit John Kramer, because he is released from the debt for a corresponding amount.

The vital point of double-entry bookkeeping is that there must be both a debit and a credit for every transaction.

For the purpose of other illustrations, let us assume that John Kramer sold one of the suits above mentioned to Tom Leahy for \$25, cash. Mr. Kramer would debit *Cash*, \$25, and would credit *Merchandise Sales*, \$25. If he sold a second suit to Will Stone on account for \$27.50, Mr. Kramer would debit *Will Stone*, \$27.50, and would credit *Merchandise Sales*, \$27.50. If the third suit were sold to James Cass for \$25 cash, you know that he should debit *Cash*, \$25, and credit *Merchandise Sales*, \$25.

The Journal. The book in which the first and detailed record of the transaction is entered is called the *journal*; for this reason, a journal is often referred to as a *book of original entry*. There are many different rulings of journals designed to meet the needs of different conditions, but *all* forms provide spaces for recording the date, the debit, the amount debited, the credit, the amount credited, and an explanation of the transaction, so that the details of the transaction will always be available for reference. A standard ruling of a journal page is shown in the next column.

In order to illustrate the use of the journal, let us record the following transactions which might occur in the grocery store of Ray Herbert on February 8:

Sold Mrs. Fox, on account, 3 sacks of flour, at \$3.10.

Received of Hiram Watts, to apply on account, \$10.

George Kull brought in 10 dozen eggs at at 40c per doz., and a clerk sold him \$5 worth of groceries on account.

Paid Will Sloane, salary for the week, \$9.

Alex Jordan brought in 20 lbs. of butter at 48c per lb., and paid \$10, both on account.

The entries to record the above transactions will be recorded in the journal as follows:

FEBRUARY 8		DR.	CR
Mrs. Fox		9.30	
Merchandise Sales			9.30
Three sacks of flour at 3.10			
Cash		10.00	
Hiram Watts			10.00
Paid on account.			
Merchandise Purchases		4.00	
Geo. Kull			4.00
Bought 10 doz eggs @ 40c			
Geo. Kull		5.00	
Merchandise Sales			5.00
Sold miscellaneous groceries			
Salaries		9.00	
Cash			9.00
Paid Will Sloane for current week.			
Merchandise Purchases		9.60	
Cash		10.00	
Alex Jordan			19.60
Credited his account with 20 lbs. of butter @ 48c, and \$10 paid in cash.			

[Many bookkeepers place the date of their transactions in the center of the journal page. Others place their dates in the so-called date column, at the left of the page.]

There are several things in the journalizing of these transactions to which attention should be called. In the first place, notice the uniform way in which the debit items are entered close to the left line of the widest column. The credit item is always entered on the line below the debit, and is slightly indented (set to the right), so that the fact that it is a credit may be seen readily. The debit amount is always entered in the first money column (going from left to right across the page), directly opposite the debit item; and likewise, the credit amount is always entered in the second money column, directly opposite the credit item. In the first five entries recorded

in the journal, there is but one debit and but one credit in each entry; such an entry is called a *simple entry*. In the last entry, there are two debit items and but one credit item, but the fundamental principle of double-entry bookkeeping is not violated, because the sum of the two debit items equals the amount of the credit item, and equality of amounts debited and credited is thus maintained. Such an entry is called a *compound entry*, though that term is little used.

The Ledger. If the daily transactions were journalized as above illustrated, it would be noticed that there are many entries involving the same debit items and the same credit items. Mr. Herbert, the groceryman, needs to know the total volume, or amount, of all like debit items and of all like credit items which have appeared in his business transactions. He wants to know, for example, exactly how much Mrs. Fox has bought of him and what she has paid; he wants to know how much cash he has received and how much he has paid out;

the same is true of purchases and sales of merchandise, and of all other items which appear in his business transactions. Accordingly, another book, called the *ledger*, is used, to which are transferred, under like headings, or titles, or items, all the entries made in the journal. The collection of like items under the one heading or title in the ledger is called an *account*, and the process of transferring the journal entries to the proper ledger accounts is called *posting*. The ledger is often referred to as a *book of final entry*, as distinguished from the journal, a book of original entry.

A common ruling of a ledger page appears below. The left-hand side of the account is to record debits to the account; the right-hand side of the account is to record the credits to the account.

If the journal of Ray Herbert, above shown, were posted, the accounts in the ledger would appear as follows. They show all the facts recorded in the Journal.

CASH

Feb	8			10 00	Feb	8			9 00
	8			10 00					

MRS. FOX

Feb	8			9 30					

ALEX. JORDAN

*					Feb.	8			10 00

GEO. KULL

Feb	8			5 00	Feb.	8			4 00

HIRAM WATTS

*					Feb	8			10 00

MERCHANDISE SALES

					Feb	8			9 30
						8			5 00

MERCHANDISE PURCHASES

Feb	8			4 00					
	8			9 60					

SALARIES

Feb.	8			9 00					

[*The debits in these accounts were made before Feb. 8, and they are omitted here, in order to simplify the illustration.]

There are several points to observe in the posting of the journal entries. First, a separate ledger account is opened with each debit or credit item, name, or title which is found in the journal. Again, debits in the journal are posted as debits in the ledger account, and credits in the journal are posted as credits in the ledger account. The entries in the journal are made chronologically, just as they occurred in sequence in business. The entries in the ledger, on the other hand, are primarily by accounts, yet under each account should be found all debit and credit data.

The accounts used to record the transactions in different businesses vary according to the kinds of transactions occurring in those businesses. It is well to remember that the account name, or heading, should always accurately describe the exact nature of the items recorded under it, so that when the owner of the business refers to his accounts, he will know exactly what each group of items means, without questioning the bookkeeper or wasting time looking up certain transactions.

The page, or folio, of the ledger to which the account is posted should be written in the journal, and likewise the page of the journal from which the item was obtained should be written in the folio column of the ledger. Thus, ready cross-reference is established, which means the saving of time in attempting to find the desired information. Bookkeepers do not insert the ledger folios in the journal until they have posted their accounts, and naturally they would not enter any journal folios in the ledger until they actually wrote the data there. As a result, one should be able to tell how far the journal has been posted by finding the last ledger folio recorded in the folio column of the journal.

The Trial Balance. Reference to the journal shown on preceding page will show that the sum of the amounts in the debit column equals the sum of the amounts in the credit column. Furthermore, debits in the journal were posted as debits in the ledger, and credits in the journal were posted as credits in the ledger. It is apparent, therefore, that *the sum of the debits in the ledger should equal the sum of the credits in the ledger.* A trial balance of totals is a list of the accounts in a ledger, together with the total debits and total credits in each of these accounts. A trial balance is usually taken at the end of each month, after all the posting for that period has been completed. Thus, the trial balance of totals of Ray Herbert on March 31 may appear as follows:

Cash	1875 00	1205 00
Accounts Receivable*	1075 00	1195 00
Merchandise Inventory	1250 00	
Furniture and Furnishings	410 00	

Delivery Truck	800 00	
Accounts Payable**	680 00	1200 00
Ray Herbert, Investment		3000 00
Ray Herbert, Drawing	175 00	120 00
Merchandise Sales		1375 00
Merchandise Purchases	980 00	
Rent Expense	75 00	
Salaries	100 00	
Advertising	15 00	
Delivery Expense	30 00	
Office Supplies	20 00	
Sundry General Expense	10 00	
	8095 00	8095 00

[*This account includes all the customers' accounts owed to the business.]

[**This account includes all the creditors' accounts owed by the business.]

The above trial balance lists the totals of both debits and credits in each account, and is known as a trial balance of totals. However, in order that Mr. Herbert may know the balance of cash on hand, or the total amount due from customers, it is necessary for him to subtract the credit amounts from the debit amounts in each account and obtain the *balance* of each. The balances of the several accounts are far more useful and informative than the totals of such accounts, and in bookkeeping a *trial balance of balances* is usually taken. The only difference between the two trial balances, of totals or of balances, is that in the latter the differences between the debits and credits of each account are listed, and if the totals of debits and credits are equal, it is clear that the differences between such totals must also be equal. The trial balance of balances for Ray Herbert on March 31 would appear as follows:

Cash	670 00	
Accounts Receivable	480 00	
Merchandise Inventory	1250 00	
Furniture and Furnishings	410 00	
Delivery Truck	800 00	
Accounts Payable		520 00
Ray Herbert, Investment		3000 00
Ray Herbert, Drawing	55 00	
Merchandise Sales		1375 00
Merchandise Purchases	980 00	
Rent Expense	75 00	
Salaries	100 00	
Advertising	15 00	
Delivery Expense	30 00	
Office Supplies	20 00	
Sundry General Expense	10 00	
	4895 00	4895 00

The Business Statements. The trial balance of balances just given tells Mr. Herbert the balance of each of the accounts, but there are many important matters of information which it does not tell him. Two of the most important of these questions are, first, how much was the profit or the loss on the business transacted during March; and second, what is the financial condition of the business on March 31. The first of these questions is answered by making a *profit and loss statement*, which shows the difference between the cost of goods sold and the sales price of such goods, and, in addition, the expenses of operating the business during the month. The financial condition of the business on March 31 is shown by making a *balance sheet*, which shows the property the business owns, the debts owed by the business, and the interest of the proprietor in the business.

The profit-and-loss statement and the balance sheet not only permit the owner of the business to have the valuable information contained in them for use as a business executive, but they also permit the banker and the wholesalers and manufacturers to learn of the credit standing of the merchant. Before banks and business men extend credit, they require statements to be filed, and if such statements, upon analysis, show the business to be in satisfactory financial condition, the merchant is allowed credit.

The Profit and Loss Statement. Before a profit and loss statement may be made, it is necessary for a merchant to count and value the merchandise on hand at the close of the period. This is called *taking an inventory*. In the trial balance of balances given above, it was shown that the merchandise inventory of Mr. Herbert on March 1 was \$1,250, that the merchandise sales for the month were \$1,375, and the merchandise purchases were \$980. Not all of the merchandise on hand at the first of the month or of the merchandise purchased was sold. Therefore, before the cost of goods sold may be determined, it is necessary to take the merchandise inventory at the close of business on March 31, and subtract the total amount from the sum of the merchandise on hand at the first of the month and the merchandise purchased during the month. Assume that Mr. Herbert finds his inventory of groceries on March 31 to amount to \$1,210. He would then determine the cost of goods sold as follows:

Inventory, Mar. 1	\$1250
Purchased during March	980
	<u>\$2230</u>
Inventory, Mar. 31	1210
Cost of Goods Sold	<u>\$1020</u>

The profit and loss statement for the month of March may then be made as follows:

Sales		1375 00
Cost of Goods Sold:		
Inventory, Mar. 1	1250 00	
Purchases	980	
	<u>2230 00</u>	
Inventory, Mar. 31	1210 00	
Cost of Goods Sold		1020 00
Gross Profit		<u>355 00</u>
Operating Expense		
Rent Expense	75 00	
Salaries	100 00	
Advertising	15 00	
Delivery Expense	30 00	
Office Supplies	20 00	
Sundry General Expense	10 00	250 00
Net Profit		<u>105 00</u>

This statement shows that Mr. Herbert sold \$1,375 of merchandise, on which he made a gross profit of \$355, that his total operating expenses were \$250, and that his net profit for the month was \$105.

The Balance Sheet. The financial condition of Mr. Herbert on March 31 is found by using those items appearing in the trial balance of balances which represent property owned, or *assets* (substituting the inventory of merchandise at the close of the month for the inventory appearing in the trial balance), debts owed, or *liabilities*, and the interest of the owner in the business, or *proprietary interest*. The balance sheet for Mr. Herbert on March 31 would appear as follows:

ASSETS			
Cash	670 00		
Accounts Receivable	480 00		
Merchandise Inventory	1210 00		
Furniture and Furnishings	410 00		
Delivery Truck	800 00		
Total Assets			3570 00
LIABILITIES			
Accounts Payable			520 00
Proprietary Interest			
Ray Herbert, Investment	3000 00		
Ray Herbert, Drawing:			
Net Profit \$105 00			
Debit balance 55 00	50 00		
Total Proprietary Interest			3050 00

It is to be noticed that the net profit, as obtained in the profit and loss statement, is

shown on the balance sheet, and that the drawing account of Mr. Herbert, which appeared in the trial balance as a debit, is subtracted from it, and the difference, a credit of \$50, extended.

[The Proprietor's drawing account is debited with cash withdrawn for personal use, with the cost of merchandise withdrawn for personal or household use, with the personal or household bills paid by the business, and with any net loss which may occur. It is credited with any net profit which may be made, and with any salary *not withdrawn in cash*. The salary of the Proprietor, paid in cash, is debited to the Salaries account, the same as though it were paid to any other employee.]

Closing the Ledger. The next step in bookkeeping procedure is to *close the ledger*, which means that the accounts appearing in the profit and loss statement will be closed into a *Profit and Loss* account, and that the balance of this *Profit and Loss* account will be transferred to the *Proprietor's Drawing Account*. The only accounts then remaining open upon the ledger will be those appearing in the balance sheet.

The various accounts relating to profit and loss may be closed into the *Profit and Loss* account in two ways—by the direct method and by the journal method. In the direct closing, entries are made in accounts, and balances of accounts are transferred to other accounts without entry in a book of original entry; hence, it is oftentimes extremely difficult to trace such items. Again, in many business offices, the closing entries must be approved by a responsible official of the company before the bookkeeper may proceed to close the books. For these and several other reasons, the direct method of closing the ledger is not used as much as formerly, and the journal method is rapidly gaining favor. In the journal closing, entries are made in the journal for recording all data and for transferring balances of accounts to other accounts. Clear and proper explanations should always accompany such entries, so that anyone who may read them and their explanations will readily understand the reason for making them.

The following entries are necessary to close the ledger of Ray Herbert on March 31:

1. To transfer the opening merchandise inventory to the *Merchandise Purchases* account:

Merchandise Purchases	1250 00	
Merchandise Inventory		1250 00

[Note: Explanations of the six closing journal entries here given are omitted.]

2. To record the closing merchandise inventory:

Merchandise Inventory	1210 00	
Merchandise Purchases		1210 00

3. To transfer the balance of the *Merchandise Purchases* account, which is the cost of the goods sold, to the *Merchandise Sales* account.

Merchandise Sales	1020 00	
Merchandise Purchases		1020 00

4. To transfer the balance of the *Merchandise Sales* account, which is the gross profit, into the *Profit and Loss* account:

Merchandise Sales	355 00	
Profit and Loss		355 00

5. To close the expense accounts into the *Profit and Loss* account:

Profit and Loss	250 00	
Rent Expense		75 00
Salaries		100 00
Advertising		15 00
Delivery Expense		30 00
Office Supplies		20 00
Sundry General Expense		10 00

6. To transfer the balance of the *Profit and Loss* account, which is the net profit for the month, to *Ray Herbert's* drawing account:

Profit and Loss	105 00	
Ray Herbert, Drawing		105 00

After the closing journal entries just given were posted to the ledger, the accounts in Ray Herbert's ledger would appear as follows:

CASH			
	1875	Balance	1205
			670
	<u>1875</u>		<u>1875</u>
Balance	670		
ACCOUNTS RECEIVABLE			
	1675	Balance	1195
			480
	<u>1675</u>		<u>1675</u>
Balance	480		

MERCHANDISE INVENTORY

<u>1250</u>	<u>1250</u>
1250	

FURNITURE AND FURNISHINGS

110	
-----	--

DELIVERY TRUCK

800	
-----	--

ACCOUNTS PAYABLE

Balance	680	1200
	<u>520</u>	
	1200	<u>1200</u>
		Balance
		<u>520</u>

RAY HERBERT, INVESTMENT

		3000
--	--	------

RAY HERBERT, DRAWING

Balance	175	120
	<u>50</u>	<u>105</u>
	<u>225</u>	<u>225</u>
		Balance
		<u>50</u>

PROFIT AND LOSS

250	355
<u>105</u>	
<u>355</u>	<u>355</u>

MERCHANDISE SALES

1020	1375
<u>355</u>	
<u>1375</u>	<u>1375</u>

MERCHANDISE PURCHASES

980	1210
<u>1250</u>	<u>1020</u>
2230	2230

RENT EXPENSE

<u>75</u>	<u>75</u>
-----------	-----------

SALARIES

100	100
-----	-----

ADVERTISING

<u>15</u>	<u>15</u>
-----------	-----------

DELIVERY EXPENSE

30	30
----	----

OFFICE SUPPLIES

<u>20</u>	<u>20</u>
-----------	-----------

SUNDRY GENERAL EXPENSE

<u>10</u>	<u>10</u>
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[In the above illustration, the standard ledger ruling has been replaced by a skeleton, or T account, form.]

Classes of Accounts: One of the important matters in bookkeeping is to classify accounts properly. There are five general classes of

accounts: assets, liabilities, proprietary interest, income, and expense.

Assets include all values belonging to the business. Thus, in the trial balance of Ray Herbert, given on a preceding page, the assets are Cash, Accounts Receivable, Merchandise Inventory, Furniture and Furnishings, Delivery Truck.

Liabilities include all values owed by the business. The liabilities of Ray Herbert are Accounts Payable.

Proprietary interest is the difference between the assets and liabilities. The proprietary interest accounts of Ray Herbert are his Investment account and his Drawing account.

Income includes the amounts received or earned by the business. The income account of Ray Herbert is Merchandise Sales.

Expenses are the amounts paid for conducting the business. The expense accounts of Ray Herbert are Rent, Salaries, Advertising, Delivery Expense, Office Supplies, and Sundry General Expense.

Partnership Bookkeeping. The only necessary difference between the books and accounts designed for two concerns in the same line of business, but one owned by an individual and the other owned by a partnership, would lie in the accounts which record the proprietary interest in the business. In the sole proprietorship, there is necessarily but one *Investment* account and but one *Drawing* account, because the business is owned by one person. In the partnership, however, each partner would have an *Investment* account and a *Drawing* account. These accounts would be treated in the same way as they are in a business owned by an individual.

Corporation Bookkeeping. The only necessary difference between the books and accounts designed for two concerns in the same line of business, one owned by an individual and the other owned by a corporation, would lie in the accounts which record the proprietary interest in the business. The owners of a corporation are its *stockholders*, and these may be changing frequently. It is not convenient, therefore, to have their names appear in the ledger, and it has become customary to have all *individual* accounts with stockholders relative to subscriptions to stock, payments of subscriptions, issuance of stock certificates, transfer of stock, etc., recorded in a separate group of books called the *stock books*. The general financial accounts of a business owned by a corporation have one account called *Capital Stock* for each kind of capital stock, which should represent the capital stock subscribed by all stockholders of the various issues, and another account called *Surplus*, which records the accumulated net profits of the corporation, not distributed in dividends to the stockholders.

Two kinds of capital stock are usually found—preferred stock and common stock; in such cases separate accounts with *Preferred Capital Stock* and with *Common Capital Stock* should be opened on the ledger.

Opening Corporation Books. The entries necessary in opening the books of a corporation vary greatly, according to the conditions under which the company is organized.

For the simplest case, let us suppose a corporation starts business with all its authorized common stock of \$50,000 subscribed and fully paid for. The journal entries would be:

Subscription Capital Stock To record the subscription, per subscription lists, to the capital stock of this company.	50,000 00	50,000 00
Cash Subscription To record the payment in full of the subscriptions to the capital stock of this company.	50,000 00	50,000 00

For the next case, let us assume that of the authorized capital stock of \$50,000, but \$30,000 was subscribed, and of this amount \$25,000 was paid in full. There are several ways in which these facts might be recorded, one frequently used being as follows:

Subscription Capital stock To record the subscription, per subscription lists, to the capital stock of this company	30,000 00	30,000 00
Cash Subscription To record the payment in full of subscriptions to the capital stock of this company	25,000 00	25,000 00

[Sometimes an account is opened with that portion of the authorized capital stock which is unsubscribed. Unsubscribed stock is not the same as *Treasury Stock*. Genuine treasury stock is that stock which has once been issued by the corporation as fully paid, and which has been either repurchased by, or donated to, the corporation.]

For a third case, let us assume that a corporation is formed to take over the business conducted by Alex Gould and Frank Reiley, and that the *partnership books* are to be *continued in use*. If the ledger shows Mr. Gould's

Investment account to be credited with \$5,000 and Mr. Reilley's *Investment* account to be credited with \$10,000, and if the capital stock of the new corporation is to be \$15,000, the journal entry to change the partnership books into corporation books is as follows:

Alex Gould, Investment	5,000 00		
Frank Reilley, Investment	10,000 00		
Capital Stock		15,000 00	
To record the transfer of the proprietary interest of the business from the partnership to the corporation.			

If the corporation were to be capitalized for \$25,000, and the difference between the sum of the investment accounts and this amount, or \$10,000, were to be issued as representing the good will of the old partnership, the journal entry would be:

Alex Gould, Investment	5,000 00		
Frank Reilley, Investment	10,000 00		
Good Will	10,000 00		
Capital Stock		25,000 00	
To record the good will of the old partnership and to record the transfer of the proprietary interest of the business from the partnership to the corporation			

If new books are to be opened by the corporation, care should be taken to see that the partnership books are properly closed. This may be done (1) by debiting the new corporation and crediting the several asset accounts it takes over, and (2) by debiting the several liability accounts assumed by the corporation and crediting the new corporation.

On the new corporation books, the following entries would be made:

Assets (detailed accounts and amounts)	20,000 00		
Gould & Reilley		20,000 00	
To record the assets of the partnership of Gould &			

Reilley this day purchased by the Gould & Reilley Co.

Gould & Reilley	20,000 00		
Liabilities (detailed accounts and amounts)		5,000 00	
Capital Stock		15,000 00	
To record the liabilities of Gould & Reilley assumed this day by the Gould & Reilley Co., and also to record the capital stock of the new corporation.			

Surplus. A corporation usually determines its net profit or loss for a fiscal period by closing all appropriate accounts into a *Profit and Loss* account, or an account or accounts of some title corresponding to this general current summary. The balance of the corporation's *Profit and Loss* account is transferred to *Surplus*, which account represents accumulated net profits in the general business corporation. In banking and financial corporations, the balance of the *Profit and Loss* account is generally carried to an *Undivided Profits* account.

If the profits of a corporation are sufficiently large, a *dividend* may be declared, payable to the stockholders in cash or stock. If it is to be a cash dividend, the entry at the time of declaration would be to debit *Surplus* and to credit *Dividends Payable*, and when paid, the entry would be to debit *Dividends Payable* and to credit *Cash*. If it is to be a stock dividend, the entry to be made when the dividend is paid would be to debit *Surplus* and to credit *Capital Stock*. Certain legal procedure is necessary to amend the articles of incorporation in order to provide a larger capitalization, and care must always be taken to see that such steps have been taken and authority obtained, if the total stock to be outstanding after the stock dividend will exceed the current authorization. If a corporation did not have a *Surplus* account upon its books, in which past net profits had exceeded the dividends, and if this corporation suffered a net loss, such a debit balance of the *Profit and Loss* account might be transferred to a *Deficit* account, rather than to the debit of *Surplus*. One would scarcely speak of a *Surplus* account with a debit balance.

Single-Entry Bookkeeping

Single-entry bookkeeping is very seldom used in the modern business office, or by individuals who wish to keep an accurate and complete record of all business transactions. In single entry, accounts are kept in theory with persons only, but an additional account is sometimes kept with *Cash*.

The persons with whom accounts are kept in single-entry bookkeeping are the proprietor, the several creditors, and the several customers.

In single entry, accounts are not kept with impersonal accounts, such as Notes Receivable, Furniture and Furnishings, Automobiles, Notes

Payable, Merchandise Sales, Merchandise Purchases, Salaries, Rent, etc. In other words, the proprietor does not keep accounts with assets, excepting customers' accounts, and sometimes Cash, or with liabilities, excepting creditors' accounts, with sources of income, or purposes of expenditure. Such a system is therefore very unsatisfactory in the vast majority of businesses, because it is impossible to make a profit and loss statement of the business. The proprietor of a business where the books are kept by single entry determines his profit and loss for the period by comparing the inventory of all things which he owns and owes at the end of a period with a similar inventory at the beginning of the period. This inventory is frequently called the *Statement of Assets and Liabilities*, and if the closing statement shows a larger net worth than the beginning statement, the difference represents what the proprietor has made during the period. Again, a trial balance cannot be taken from a single-entry ledger, because only the personal accounts are recorded.

Books Used. In single entry, the usual books kept are the journal and the ledger. Sometimes a cash book is also kept.

To illustrate the use of single-entry books, suppose you sold Tom Andrews a pair of skates for \$2, and that he agreed to pay you one week later. In single entry, this would be recorded on a sheet ruled as below, called the standard journal ruling:

	Feb. 25				
	Tom Andrews				
	Sold him skates			2 00	

[The first money column of this journal ruling is used for recording debits to persons, the second money column for recording credits to persons.]

Now, suppose that Tom Andrews has bought other things from you, has made several small payments, and that you want to make out a bill of what he owes you. If you had to look through all the items in the journal it would take you a long time. That is why you keep a second book, called a *ledger*, in which all the items of business with each person are gathered together on one page. You should copy, or as bookkeepers say, *post* your entries from the journal into the ledger as soon as they are made, so that your ledger will always be up to date. Then when you want to see how much any person owes you, only a moment is needed.

The amounts in the debit column of the journal are posted to the left-hand, or debit, side of the ledger page; the amounts in the credit column are posted to the right-hand, or credit, side of the ledger page.

The ledger account with Tom Andrews might appear as follows:

TOM ANDREWS									
Feb.	1	Books	1	4 00	Feb.	3	Cash	1	1 00
	25	Skates	3	2 00		10	Cash	2	1 00
	27	Camera	3	3 00		17	Cash	2	1 00
						26	Cash	3	50
					Mar.	2	Cash	3	2 00

This ledger account shows you that Tom Andrews has bought \$9.00 in merchandise from you, and has paid you \$5.50, and thus still owes \$3.50.

The Cash Book. The journal and the ledger are the only two books necessary in single-entry bookkeeping, but others are often helpful. The commonest of these *auxiliary* books is the *cash book*. It is really a journal for transactions in which cash is concerned.

The cash book may confuse a beginner in bookkeeping, for its left-hand column is for receipts of cash, which must be credited to people, and its right-hand column for disbursements, which must be debited to people—just the opposite of the journal. This is a feature copied from double-entry bookkeeping, and aside from custom, there is no reason why it should be adopted in single entry. But it is always wise to follow custom in such matters, so that accounts can be understood by people other than the bookkeeper.

The advantage of the cash book is ease in *balancing* the cash. If the sum of the column for receipts is \$3.00 greater than the sum of the column for disbursements, this amount is said to be the *balance*. It should exactly equal the cash on hand. All receipts or payments of money should therefore be recorded in the cash book, even if, because no accounts with persons are affected, they will not be posted to the ledger. The word *balance* really stands for the sum necessary to balance, or make equal, the two columns. It is also used in speaking of accounts in the ledger. Thus, in the Tom Andrews account shown above, the amount \$3.50 (the difference between \$9.00 and \$5.50) is the balance; it is called a *debit balance*, because the debit figures have the larger total.

Determining Profits. In single-entry bookkeeping, to find out how much money a business has made in the course of a year, it is necessary to find the sum of all balances owed to the business, the sum of all balances owed by it, the value of property which it owns, and the amount of cash on hand. Suppose the state of a small merchant's affairs to be as shown below:

Due from customers . . .	\$ 495.80
Merchandise on hand . . .	2480.63
Cash on hand . . .	157.20
Total . . .	\$3133.63
Due to others . . .	\$ 287.24

The figure \$3133.63 represents *total assets*. The figure \$287.24 is for *liabilities*, and if it is subtracted from the other, the difference is the merchant's *net worth*, or the amount of property he would have after paying his debts. The difference between the present net worth and that of a year ago will, in a general way, show the profits for the period, as follows:

Total assets.....	\$3133.63
Liabilities.....	287.24
Net worth (by subtraction).....	\$2846 39
Net worth a year ago	2000 00
Profit for the year (by subtraction).....	846 39

Thus are single-entry essentials explained.

Special Forms

Farm Bookkeeping. There is no class of business man to whom the keeping of good accounts will be more helpful than to the farmer. There are many farm-owners and farm-renters in the world who continue raising unprofitable crops year after year because they are unaware that they are doing so. For instance, a farmer may be making money on corn and losing on wheat, but because he has a profit from his operations as a whole, he does not discover this. Or it may be that he is deriving less income from the farm which he owns than he would from investing his money elsewhere and renting a farm. In fact, a pamphlet issued by the United States Department of Agriculture says there is reason to believe that the majority of farmers are really living on the interest of their investments rather than on the profits from their farms.

Farm bookkeeping is not difficult. Only a few minutes a day are necessary on the average farm to preserve thorough records. But the difficulty has been that there has been nobody to teach a farmer how to keep his books, for the reason that accounts of the style kept in most commercial institutions are usually quite unsuited to the farm. Recently, however, the United States government has studied the matter, and several bulletins on the subject have been issued by the Department of Agriculture, which it will pay any farmer to read. To comprehend them thoroughly, he should have an understanding of the principles explained in the earlier part of this article and under the head ACCOUNTANCY.

To open books for the farm, an inventory must be taken of all property. Some of the accounts to be opened will be exactly similar to those described above; an instance of this is Machinery. In addition there will be such accounts as Livestock and Poultry. The account for Real Estate (including buildings) will be charged for rent, taxes, insurance, repairs, and depreciation, and credited at the end of the year for its service to the different parts of the farm. Cash, notes, and accounts are the same as for customary bookkeeping. Reasonable wages should be credited to the farmer and any members of his family who do work which would otherwise have to be paid for. Household Expense should be kept separate from Farm Expense, and any vegetables, milk,

or other products of the farm used at home that could be sold should be charged to the household and credited to the proper division of the farm. Similarly, in order to learn the cost of keeping cattle, any of their fodder which is raised on the farm should be charged to the cattle expense account, just as though it had been bought. To the accounts which represent the products of the farm (corresponding to the merchant's Merchandise accounts) should be charged the labor, seed, fertilizers, and other elements of cost.

At the end of a year, under such a system, the books will show with considerable exactness the profits of the farm. If to these are added the household, personal, and other expenses which the farm has paid for the farmer, and a reasonable amount for the rent of the farmhouse, the resulting sum will be the actual return to the farmer on his investment. If this return is not as high a percentage as could be secured through investment elsewhere, the farmer may consider that he has lost money. This applies to the man who rents his land and owns only his machinery and stock, as well as to the one who owns both.

Labor-Saving Books. In the explanation of double-entry bookkeeping procedure which has been given above, it will be noticed that there are five distinct steps in the process:

1. Journalizing the transaction.
2. Posting to the ledger.
3. Taking a trial balance.
4. Preparing the statements.
5. Closing the ledger.

As the volume of transactions increases, it is necessary to introduce many labor-saving devices to record the bookkeeping data efficiently and economically. Among the more common methods followed are the use of special journals (such as cash journal, sales journal, purchases journal), and the use of summary controlling accounts in the ledger which give in total the sum of the balances of many individual accounts in subsidiary or auxiliary ledgers.

These special books or journals and subsidiary ledgers are here briefly described. When special books or journals are used, the journal which has already been explained is usually referred to as a general journal, and when subsidiary ledgers are used, the ledger already explained is usually referred to as a general ledger.

The *cash book* or *journal* may be considered as a subdivision of the journal already explained, in which only cash items are entered. In its usual form, the left-hand page is for cash received, the right-hand, for cash paid out. Every item on the left-hand page represents a debit to *Cash* and a credit to some other account. It is obvious, then, that the cash items need not be posted to the cash account in the ledger until the time of posting, when the *total* of all the items credited to other accounts can be debited to *Cash*. Likewise, every item on the right-hand page represents a credit to *Cash* and a debit to some other account, and at the time of posting, the total of all the items debited to other accounts can be credited to *Cash*. Thus, much time is saved through not having to write the word *Cash* whenever that account is an element of a transaction, and through posting but one debit and credit to *Cash* rather than all the individual debit items and all the individual credit items.

A *sales book*, or *sales journal*, is another subdivision of the journal in which only merchandise sales are entered. The journal page is frequently used as a sales book or journal, the items of the sale being entered in the first column, and the total of each sale in the second column. At the time of posting, the sales are debited to the proper individual's accounts, and the sum of all the sales is credited to *Merchandise Sales*. Thus, time and labor are saved in not writing the word *Merchandise Sales* whenever that account is an element of a transaction, and in posting the grand total of all sales to the credit of *Merchandise Sales* rather than the totals of individual sales.

A *purchase book*, or *purchase journal*, is another subdivision of the journal in which only merchandise purchases are entered. The journal page is frequently used as a purchase book or journal, the items of the purchase being entered in the first column and the total of each purchase in the second column. At the time of posting, the purchases are credited to the proper individual's accounts, and the sum of all the purchases is debited to *Merchandise Purchases*. Thus, time and labor are saved in not writing the word *Merchandise Purchases* whenever that account is an element of a transaction, and in posting the grand total of all purchases to the debit of *Merchandise Purchases*, rather than the totals of individual purchases.

Just as the journal is often subdivided into special books or journals, so certain accounts in the ledger may have subsidiary ledgers which contain the detailed individual accounts. The general ledger accounts in such cases control the subsidiary ledgers in that the balance of the controlling accounts should at all times equal the sum of the balances of the individual accounts in the subsidiary ledger. Such a con-

trolling account with its subsidiary ledger is particularly helpful to any concern which has a large number of accounts with customers or creditors.

In the case of customers, the subsidiary ledger is frequently called the *sales ledger*, and it contains an account with each customer, to which entries are posted instead of to similar accounts in the general ledger. In the latter, however, is the controlling account called *Accounts Receivable*, to which is posted the *total* of all debits and credits to customers' accounts. Care must always be taken to be certain that the balance of the controlling account equals the sum of the balances of the individual accounts.

In the case of creditors, the subsidiary ledger is frequently called the *purchase ledger*, and it contains an account with each creditor, to which entries are posted instead of to similar accounts in the general ledger. In the latter, however, is the controlling account called *Accounts Payable*, to which is posted the *total* of all debits and credits to creditors' accounts. Care must always be taken to be certain that the balance of the controlling account equals the sum of the balances in the individual accounts.

Readers who may be interested in the further development of double-entry bookkeeping principles, methods, and accounts should obtain and study a copy of a standard bookkeeping textbook.

Bookkeeping for Children. Many parents find it pleasant as well as profitable, when a child has reached the age of ten years, to instruct it in the simpler principles of keeping accounts. Most children grow up without learning even the rudiments of bookkeeping, and when they have to face the handling of their own affairs, suddenly find themselves helpless. Boys may acquire the necessary knowledge after they enter business, but girls ordinarily have no occasion to, unless they are left alone in the world, in the very situation in which they need it most. It is easier to teach money-handling to a young child than to an older one, because for the former it can be made an interesting part of play, but the latter is apt to regard the necessary work as drudgery.

The First Steps. Here is the method by which one father taught his little girl the fundamentals of account-keeping. She was still in the penny stage, but had already learned that it was wise not to spend her pennies for candy as fast as she acquired them, but to save a few for other childish wants that might arise. One day her father gave her a small cash box. They counted her money, and found that she had fourteen cents. Then he showed her how to make out a little slip to put in place of any pennies she took from the box. The first one read, *Candy, 2¢*, and the next day, when her



BOOKPLATE OF GEORGE WASHINGTON

(See page 851.)



BOOKPLATE OF FORMER EMPEROR WILLIAM II

mother borrowed from her, a second slip said *Lent to mamma, 5¢*. When her mother returned the money, the slip was torn up. Later, after she had mastered these simple steps, the little girl was shown how to take a receipt from her mother for money borrowed and how to return it when the slip was destroyed. On another day, when given more pennies, she was told to write a slip, *Given me by mamma, 10¢*, so that this transaction could not be confused with money paid back after a loan.

When the first of the month came, the father showed his young pupil how easy it was to *balance* her cash. First of all, they counted the pennies in the box and found sixteen. They knew that at first she had fourteen cents, and the slips showed that she had been given ten cents, so there was a total of twenty-four cents for which to account. Since sixteen cents was on hand, eight cents must have been spent. But the slips told only of seven cents having been taken out of the box, so her father made it clear to her that she must have forgotten a slip for one cent. And then the little girl suddenly remembered that she had hurried to get a penny to give to the organ-grinder's monkey, and so had neglected her bookkeeping.

To make things easier for the next month, all the slips were torn up and a new one put in which said, *Balance on hand February 1, 16¢*. Of course, if there had been any slips representing money lent, they would have been preserved.

The Simplest Books. From the cash box and

its slips, it was a natural advance to a *cash book*, or *cash journal*. The child could see, especially when she began to have more slips, that it would be an advantage to write her records in a book. In the first place, this would prevent slips being lost; in the second place, it would save the time of copying all the figures upon one sheet of paper when the cash was to be balanced; and best of all, it would give her an opportunity to compare one month's affairs with another. For five cents, her father bought a little book with a single column on each page. He showed the little bookkeeper how to write on the left-hand page the explanations for money received, and on the right-hand page those for money taken out of the box, and how to put the figures directly under each other in the columns, so that addition was easy. He told her not to cross out items representing loans when the sums were repaid, as she had torn up slips, but to make an independent entry on the *Cash Received* side of the page.

Little folks do not have enough to do with lending and borrowing to need a ledger. The signed receipts show money that is to come in, and if a debt is contracted a temporary slip can be made out. Later, the advantage of a ledger will appear, and then parents may easily explain its principles, or even start a child in a simple system of double entry by studying the first part of this article, which explains the more advanced steps in bookkeeping. See ACCOUNTANCY.

F.H.E.

BOOKPLATE, a printed or engraved label pasted in a book as a mark of ownership. It is usually made of paper, but vellum, morocco leather, and other materials are sometimes used. The best bookplates are impressions from engravings on copper or wood, but zinc etching and other less expensive processes are also employed. A printed label, bearing only the name and address of the owner, is an inexpensive and dignified substitute for the more elaborate and decorative designs.

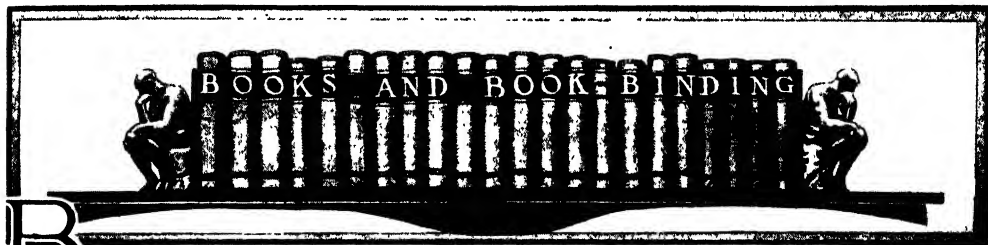
Bookplates were first used in Germany, during the last quarter of the fifteenth century. These were crude affairs, usually colored by hand. The earliest known printed copy was used about 1480, and the earliest dated bookplate was designed by Albert Dürer (which see) in 1516. From Dürer's day to our own the lover of good books has lavished care and skill on the ornamentation of his bookplate. For many years, its most prominent feature was the owner's coat-of-arms, but this style has been partly displaced by allegorical or pictorial designs. One of the greatest book collectors of

all time was Robert Hoe, the son of the man who invented the rotary printing press; the central feature of his own bookplate was an old hand printing press. In place of the idea that it must show the owner's lineage, a bookplate now usually indicates something of his character and tastes.

The collection of bookplates and of books containing bookplates is a fascinating pastime. Many of the plates designed by great artists, such as Dürer, Holbein, and Hogarth, are worthy of a place in an art collection. There are also bookplates of famous men, many of them designed by artists of note. The bookplates of George Washington, Daniel Webster, Horace Walpole, David Garrick, Gladstone, Dickens, Carlyle, Tennyson, and Victor Hugo are among the most sought-for examples. The modern tendency in decoration is shown in the copy of the plate of the former German emperor, with the imperial insignia.

BOOK OF COMMON PRAYER. See NONCONFORMIST.

BOOK OF MORMON. See SMITH, JOSEPH.



BOOKS AND BOOKBINDING. In an essay called *Heroes and Hero Worship*, Thomas Carlyle says: "All that mankind has done, thought, gained, or been, is lying as in magic preservation in the pages of books." By books, Carlyle meant all written records, whether preserved in manuscript or in printed form. The present article deals only with printed books; the written records of civilization are discussed in the article **MANUSCRIPT**.

Modern Bookmaking. Modern bookmaking comprises three distinct processes—typesetting, printing, and binding. The invention of printing from movable types is usually credited to John Gutenberg, and the date assigned is 1450. The first book printed from movable types was a Latin Bible in two large volumes; a few copies of it are still in existence, and an exceptionally fine one was sold in New York at public auction in 1911 for \$50,000. The history of printing and the steps which make up the process are given in the article **PRINTING**.

At first, the only books printed were copies of the Greek and Roman classics and religious works. They were bound without title page, and usually there was no statement as to when, where, or by whom the books were printed.

Occasionally, the printer put in a paragraph on the last page of the book containing this information, and used the seal of the town in which he lived, or his own coat of arms, as a trade-mark. The first dated title page was used in 1470, but title pages did not become common until after 1500. Most of the books were very large. The Bibles were especially unwieldy, and the paper on which they were printed was very thick and strong.

About the year 1500, smaller volumes began to appear. Books were read more and more, and they had to be made so that they could be handled conveniently. Thinner paper was used, and pasteboard was substituted for wooden boards for stiffening the binding. During the seventeenth century, the art of printing was at its worst, but the badly printed pages were often most beautifully bound in ornamented leather, or in velvet, which was gaily embroidered in gold and silver and bright-colored threads.

At the end of the eighteenth century and the beginning of the nineteenth, bookmaking advanced conspicuously. The outward appearance of books was greatly changed by the introduction of glazed cloth as a covering for the

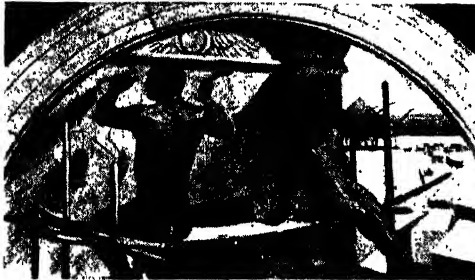


1. The cairn.



Photos U & U

2. Story-telling.



Six originals painted by J. W. Alexander

3. Egyptian hieroglyphics
EVOLUTION OF THE BOOK

pasteboard sides. Better paper was used, and printing presses were greatly improved. The most famous artists of the day were doing book illustrations, principally engravings on copper and woodcuts, but also etchings and lithographs. These methods have been almost entirely superseded by zinc etchings, halftones, and other photomechanical processes. A noteworthy feature of the last decade of the century was the general revival of printing as an art, due chiefly to William Morris, the English poet, painter, and craftsman. The most noteworthy advance of recent years has been the introduction of very thin paper, called *India paper*, in standard books, resulting in volumes only an inch thick, yet containing a thousand pages. Such paper is hard to handle, and has been largely superseded by a paper somewhat heavier, but still much lighter than the average of the last century.

Book Publishing and Selling. There was a time when the author of a book was often also the publisher and bookseller, and not so many years ago books were sold only at the printer's or the author's house. Practically all of the early printers acted as their own booksellers, and later some of them began to print books for other printers, and to carry in stock books printed by others. To-day, however, few authors have a more intimate connection with the publishing and selling of books than to make their terms with the publishing company and receive their royalties, the royalty being

a percentage of the price at which the book is sold. The publisher makes all arrangements for printing and binding, and also distributes the book through the retail booksellers.

American Book Trade. In 1672 the first book store was opened in Boston by a man named Hezekiah Usher. Benjamin Franklin, too, was one of the early American printers and booksellers, and because of his many other achievements, he probably did more than anyone else to make the new trade famous. Many of the books sold by the early booksellers were imported from Europe, but the printing trade prospered, for the American printers, instead of importing the books they hoped to sell, would simply reprint as many copies as they wished. As for paying the foreign author or publisher, no one dreamed of such a thing. After the War of Secession, although there was still no copyright law, there was so much rivalry among the American publishers as to who should get out some new book that had been published in England, that they began offering large sums of money for advance sheets. Boston, New York, and Philadelphia became and have remained the leading publishing centers of the United States, but Chicago has advanced rapidly in recent years.

Some Statistics. Between the years 1825 and 1840, about 1,115 books were published in the United States. In 1880, when the country's population was 50,000,000, not more than 2,000 books were published. By 1920, when the population had more than doubled, the publication of books had increased nearly seven-fold; it now numbers each year almost 15,000 titles. More books of fiction were formerly published than any other kind. The production of school books during the entire nineteenth century and since the beginning of the twentieth has been remarkable. Webster's speller sold at the rate of more than a million copies a year for many successive years. School books, prayer books, Bibles, and hymn books have sold in enormous numbers. The total number of copies of books and pamphlets published in the United States in a single year is approximately 400,000,000.



4. Picture writing.



5. Manuscript.

Bookbinding

This name is applied to the process of putting the printed pages of a book between covers. Once an art, or, more properly, a handicraft, it has grown into a mammoth industry. Instead of the old-time patient workman who spent days on a single book, we have to-day machines which turn out 10,000 bound books in a day. Books are still bound, and beautifully bound, by hand, but the real triumph of our age is to be able to print and bind books not by the dozen or hundred, but by the thousand or hundred thousand, so that by increasing output and decreasing cost, they may come within the reach of everyone. America leads the world in the invention and use of machinery for binding books. In an up-to-date bindery, nearly all the work is done by machines of American invention, and some of the machines do not even require an operator. Bookbinding includes the entire process of putting the book between covers—folding, gathering, and stitching the sheets, making and decorating the cover, and fastening it to the book.

It will have been observed, from a description of book printing, that book pages are printed on large sheets in forms of from sixteen to one hundred and twenty-eight pages. Obviously, it follows that some method of reducing these large printed sheets to workable units for binding must be followed.

The printer in laying out a book for printing selects an imposition (or arrangement) of the printed pages best suited to the size of the finished book, the number of pages in the book, and the number of pages which the thickness and character of paper will permit the binder to fold into individual sections or signatures.

From the presses the printed sheets, in orderly piles, go to folding machines capable of folding a great variety of impositions. Here, sheet by sheet, the printed forms are propelled by mechanical fingers into huge machines that cut apart the large sheets and reduce, by folding, the sections of the large sheet into folded signatures. These may consist of eight, sixteen, twenty-four, or thirty-two pages each.



On the walls of the Congressional Library, Washington

6. The printing press.

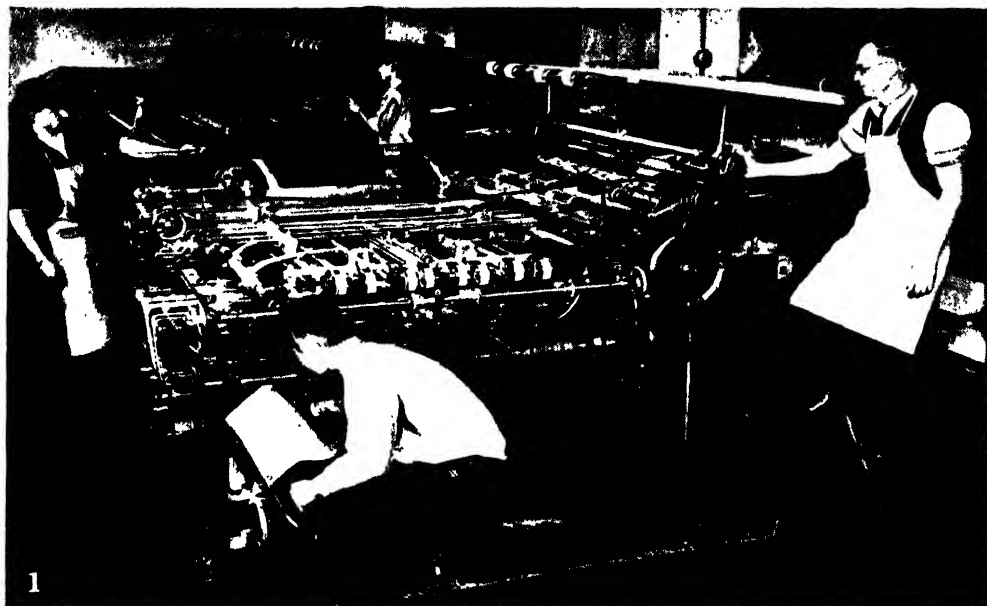
EVOLUTION OF THE BOOK

After inspection, these sections are bundled under pressure and passed along for pasting, reinforcing, or gathering.

Pasting, the term denoting the affixing of inserts into the several sections, is not, as most people believe, accomplished after binding, nor by inserting each successive insert one at a time into the individual book. Automatically fed machines firmly paste insert leaves (illustrations) to the *outside* of sections. All leaves that go *inside* the pages of a section must be pasted-in by hand work. Girls become very adept in this work. Each insert leaf is handled by itself, i. e., as many as ten thousand or more of the *same* insert may be pasted into an equal number of the *same* signature by one girl. And so on, until all the insert leaves are properly placed in all the sections.

Meanwhile the plain end-papers, which later are made to adhere to the inner portion of the cover, are prepared and pasted to the first and last sections of the book. Likewise any strengthening features, such as concealed muslin joints, whipstitchings to strengthen end or heavily pasted sections, will be attended to. There are many types of inserts and of reinforcements, each requiring some particular method of treatment.

The book is now ready for gathering, which is the operation of bringing all the sections of a book, which up to now are separate units, into logical sequence and constituting a complete book. Small editions are often assembled



How The World Book Is Made. After the great presses print the sheets, these are sent to the bindery, where complete books are produced. (1) A machine which folds the large sheets into page size. (2) Pasting maps and colored pictures into loose sections. (3) Gathering the sections and placing them in order. (4) Sewing the gathered sections; sewed volumes are seen on the shelf. (5) Trimming the edges of the volumes



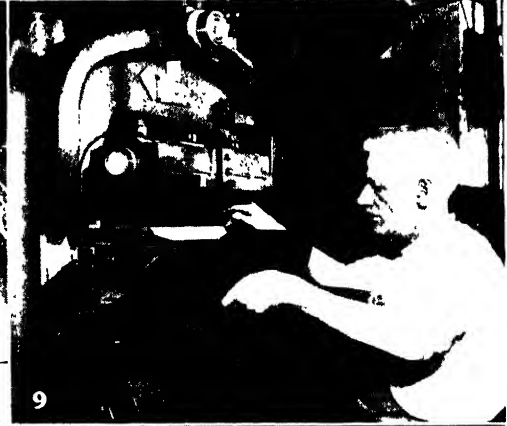
6



7



8



9



10

How the World Book Is Made. Continuing the process of bookbinding, as shown on opposite page: (6) Lining machines, which attach cloth supports to the volume. (7) Making covers. (8) Applying pure gold-leaf to the lettering on the cover; this material is very expensive, and care is exercised that little of it shall be wasted. (9) Embossing the lettering on the covers. (10) Girls who are expert at their work inspect every finished volume for defects in manufacture.

or gathered by girl operatives. This is called hand gathering. The majority of gathering in edition plants is performed to-day by huge gathering or assembling machines, which consist of thirty pockets, or magazines, and a traveling conveyor. As the machine is operated, one of each section is dropped simultaneously onto the traveling conveyor, and the gathered books emerge at the delivery end at the rate of from ten to thirty thousand a day. This is one of the most valuable of labor-saving devices.

Gathered books must next be sewn to hold the several sections together and provide a firm but flexible binding unit. There are many types of book-sewing machines, but all operate on a similar principle. Each section is laid over an arm of the machine, which carries it into the machine mechanism, where rapidly moving needles, operating at marvelous speed, actually sew each section to the next with thread. The books emerge from the machines in a solid block and are separated by cutting the thread between each two books. There is a lockstitch which prevents threads from unraveling.

Books of the better sort, and of difficult makeup, are often collated before sewing to prevent duplication of sections or more serious errors. Collating consists of looking through each individual book and checking the page sequences, and sometimes the placing of inserts, reinforcements, etc.

As papers vary in bulk and a "swell" is caused in sewing, by reason of the thickness of two threads added in each section, it is necessary to smash or nip books after sewing to secure uniform bulk and to avoid a wedge-shaped book. Uniform thickness is essential that the covers, which are being made while the books are being prepared, shall properly fit when book and cover are put together. Smashing is accomplished by squeezing sewed books, either singly or in groups of two or more, depending on book bulk, between the upper and lower jaws of huge power-driven compressors. Nipping consists of squeezing along the back or binding edge only, instead of smashing the entire book, and is usually employed on hard-finished papers, especially such as are used in school books.

Trimming or cutting the three edges becomes the next operation. Power machines with one, two, or three knives are employed, and books are trimmed either singly or in units of two or more as bulk and character of paper and book permit. A continuously operating book trimmer, in which all three edges are trimmed simultaneously at the rate of from twenty to thirty-five thousand each day, is a most interesting machine. For rough-cut edges, the same machines are employed, but only the top edge is actually smooth cut, while side and

foot edges are barely trimmed enough to open the folded edges of the sections. Following this partial trimming, the books are fed with the side and foot edges against an abrasive disk or wheel which roughens these edges, simulating an old-time de luxe deckle edge on paper. Books that are to have rounded corners are again cut after edge trimming, this time with circular corner knives which merely round off the corners. Bibles are excellent examples of round-cornered books.

Edge treatment takes many forms. The most familiar is undoubtedly the gilded top or full edges. To accomplish this, trimmed books, carefully jogged-up, are arranged in rows in gilders' presses or clamps, the edges scraped and sanded until absolutely smooth; then a paste filler is applied, the edges sized with a liquid albumen mixture, and genuine gold in leaves $3\frac{1}{2}'' \times 3\frac{1}{4}''$ laid on by hand, each leaf overlapping the next a trifle. After drying, the gold-covered edges are burnished by means of an agate or bloodstone tool in the hands of an experienced gilder, after which books are removed from the press and separated.

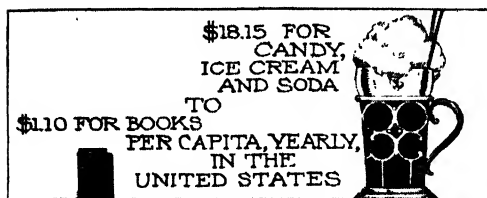
Marbling, the result of which is the variegated edge so popular on reference sets and encyclopedias, is obtained by dipping the edges of a few books at a time, held together between wood boards by a clamp, in a vat, on the surface of which have been spattered and waved or combed water colors in any desired pattern and combination of colors. Such treatment is usually given to sets of books, and not to single volumes.

Colored edges, having one solid color, are the result of sponge or brush coloring, using aniline or pulp coloring. Solid and sprinkled effects are also secured to-day by means of air-brush sprays.

Sprinkled or speckled edges are obtained by rubbing a stiff brush saturated with pulp color over a coarse-mesh wire screen held above the book edges while the books are laid out on a table, back edge on table, the three other edges facing upward.

Following any edge treatment comes a coating of flexible glue applied the full width and length of the back edge. While the glue is still soft but not sticky, books are fed, one at a time, into a noisy machine that, as it receives the book, rolls it out a bit to give the concave front edge and convex back edge, and gripping it between two sharp steel jaws about $\frac{1}{4}''$ from the back edge, by means of a concave steel shaping-iron, imparts the rounded shape to the back edge and sets up the ridges which appear along the back edge, on either side of the book, against which the cover boards are to fit. This rounding and backing, as it is called, shapes the book and prepares it to fit the cover properly, to be opened easily, and to lie flat when opened.

As a book would lack strength and durability if held together merely by thread and glue, it is necessary to affix some reinforcing to the



THE "SWEET TOOTH" AND THE KEEN MIND

About seventeen times as much money is spent yearly in the United States for confections as for books.

back edge. In ordinary bindings, this consists of a thorough gluing, the application of a piece of coarse mesh or super (also called crash), which projects over the width of the back edge on either side about one inch, and nearly to the top and bottom edges of the book. Over the super goes another gluing, and on top a piece of firm, strong paper the length and width of the book back.

On heavy books and on school books, it is quite customary to affix two supers instead of one; one of these would be a fine mesh and the other a coarser mesh.

When desired, headbands, the little ornamental pieces of book cloth, shirting, or woven cotton or silk in variegated colors, that appear at the head and tail edges of books in the space between the back of book and the backbone or shelf-back edge of cover, are affixed during this reinforcing operation, which is termed lining-up.

Until recent years, it was necessary to do all of this lining-up and headbanding by hand. To-day there are several ingenious machines which accomplish the same results at less cost than by hand, at far greater speed, and with equal quality to the product.

The book is now ready for its cover. Meanwhile, the various operations incident to the production of the cover have been progressing simultaneously.

Book cloths, artificial leathers, and other cover fabrics are delivered by the manufacturers to the binder in rolls. These rolls are from 36" to 50" wide and from 40 to 500 yards in length. The modern bindery employs slitting and winding machines, also marvelous adjustable cutting machines for preparing these fabrics for cover-making machines or for hand production.

Board for stiffening covers is obtainable in a great variety of qualities, thicknesses, and sizes. Here again machines are employed to transform the raw material into units to satisfy the cavernous maw of machines that produce made covers.

Cover-making machines that accept cloth in rolls of proper width, boards in huge magazines,

and feed the back-lining paper necessary to strengthen the shelf back of the cover, to the number of sixteen to twenty thousand finished covers a day, are common factors in binderies to-day.

Different types of machines, both hand- and machine-fed, will produce in less quantities similar and other types of covers, including semi-flexible and parti-cloth or leather covers.

For round- and square-cornered flexible leather, artificial leather, and cloth covers we must resort to hand work in combination with gluing-off machines, round-corner turning-in devices, and the like.

Embellishing the covers by means of ink, gold, or foils is a fascinating operation to watch. Inking presses, automatically feeding their own covers and producing eighteen thousand perfectly inked covers a day, contribute their share to our low-cost popular novels and moderately priced school books. Huge embossing and stamping presses, with attachments which feed gold or artificial gold ribbons while the operator inserts and removes the covers, produce an endless variety of finished covers. Still larger embossing presses, that appear capable of handling sheets of steel, turn a plain, unattractive cover or piece of material into articles of beauty and long life. Here we find girls cutting and laying sheets of real gold on covers preparatory to the slower and more difficult operation of stamping delicate fabrics and leathers, while others remove, by careful brushing and rubbing, the surplus gold or metal particles.

The cover and book are now ready to be combined. Again machines are employed to shape the backbone of each cover by passing the covers over a heated shaping iron in order that no unsightly bulges or wrinkles may spoil the appearance of the product. Likewise, machines combine book and cover, feeding covers from a magazine while the book is fed in by hand and removed in the same manner when safely encased in cover.

This is not the end. The still damp book must next be laid between wooden pressing



BOOKS AND TOBACCO

There are 500,000 tobacco dealers in the United States, and only about 2,500 bookstores.

boards, having metal edgings that project over the edge of the boards (to set book firmly in cover along the back or binding edge and to create the little "valleys" that appear along

the back edge on both sides of the cover), and be put under pressure in a press or clamp to dry.

After drying from six to twelve hours presses or clamps are opened, the books are inspected, encased in plain or printed jackets (or other wrapping), packed for shipment, and the binding is completed.

This, briefly, is the story of modern edition binding. A thousand digressions might be made to amplify the operations or explain the details of the many varieties of bindings encountered in any bindery, but that would provide subject matter for a volume in itself.

The Art of Bookbinding. If we consider binding as a method of preserving documents, the Assyrian tablets in the British Museum, dating from the sixteenth century B.C., were bound, for they were placed in a sort of envelope made of terra cotta. The earliest Oriental books, which were written on separate leaves, were placed between two flat pieces of wood, copper, or richly carved ivory, and bound tightly together with a leather thong. The Greeks and Romans wrapped a leather cover around their waxed tablets of wood. Papyrus and parchment books, however, were usually written on a long strip of the material and rolled up, just as modern maps are rolled, to preserve them. Gradually, the binding of books became a craft that equaled the making of rare jewelry, and books were cherished for their beauty and not for their contents. Enormous books bound in bright-colored leathers were sometimes carried in public processions. Books with vellum leaves, bound between plates of silver studded with precious stones—marvels of beauty and workmanship—adorned the altars of cathedrals. Some of the old books had covers of enamel; some had carved ivory covers; others had covers studded with crystals, gems, and cameos. The book of the Gospels on which the English kings took their coronation oath was bound between boards an inch thick, fastened together with leather thongs, and had ornaments of hammered brass on the corners and a huge brazen crucifix on the side.

Chinese and Japanese Bookbinding. The art of making paper was invented by the Chinese, probably in the first century A.D., although it did not reach Europe until nearly a thousand years later. The Chinese, too, were using block printing long before it was invented in the West. But whereas we have to-day countless machines for printing and binding, the Chinese and Japanese until recently were printing and binding as they did a thousand years ago. They print their books on paper so thin that only one side can be used. All the sheets are double, with a folded instead of a cut edge, and sometimes, if the paper is very thin, there is an interlining of paper, as well,

making three thicknesses in all. The books are put between cloth-covered pasteboard, the leaves are sewed together, and the covers are sewed on at the same time. E.W.P.

Related Subjects. Material of interest to the reader of this article will be found under the following headings:

Arts and Crafts	Gutenberg, Johannes
Bookplate	Manuscript
Caxton, William	Morris, William
Faust, Johann	Printing

BOOKWORM, a grub that feeds on the leather and paste of book bindings, and sometimes even eats holes in the paper. Bookworms are the larvae of a species of beetle (see DEATH-WATCH). A single grub is reported to have eaten its way through twenty-seven books. Bookworms often cause serious damage in libraries. The best preventive is frequent overhauling of books; the grubs can be eradicated by exposing books in a tight box to the fumes of carbon bisulphide. W.J.S.

[A person who spends more time with books than with people is called a "bookworm"]

BOOMERANG, *boom' ur ang*, a famous missile which originated with the Australian aborigines, the best-known form of which, when thrown, returns to its owner. The re-



FORMS OF BOOMERANGS

turn boomerang is shaped like a sickle, or a rude and very open V, and it is a deadly weapon in the hands of experts. It is about three feet in length, and it weighs from eight ounces upward. It can be thrown accurately at least a hundred yards. The non-return boomerang is straighter, and is thrown as nearly as possible in a straight line. The use of the boomerang has much decreased with the introduction of more effective weapons, and it has become largely a somewhat dangerous toy, though the Australian natives in the interior of the country sometimes use it to kill birds. Some of the natives of India also make boomerangs.

[A false statement made by a person, coming back to embarrass him, is called a boomerang]

BOOMER STATE, a popular name for Oklahoma (which see).

BOONE, DANIEL (1734-1820). Through several hundred miles of picturesque country in North Carolina, Tennessee, Kentucky, and Virginia, there extends a marked trail showing the travels of America's most famous pioneer of the early colonial period. Daniel Boone's life and exploits are the delight of every boy

who has read stories of the early backwoodsmen. He is especially the hero of the Kentuckian, but was born in Pennsylvania, near the present city of Reading.

When Daniel was about seventeen years old, his father moved with the family to a place at the forks of the Yadkin, in Davie County, then on the North Carolina frontier. Theyouth learned to read and write, and he picked up enough arithmetic to enable him to make land surveys, but in the lore of the woods and in sagacity and fearlessness, not even the craftiest Indian could outdo him, and among his companions he excelled as a hunter and trapper.

From the time he was twenty, his life was full of adventure. He took part in the disastrous Braddock expedition against Fort Duquesne in 1755 (see BRADDOCK, EDWARD), was a leader in protecting the frontier against Indian attacks, and fought in an Indian conflict just before the outbreak of the Revolution. Thus he learned about Indians.

In 1767 he had made his first expedition into the wilds of Kentucky. Eight years later, he led a party of settlers to that region, and they built a fort on the Kentucky River, calling it Boonesboro. Thither he brought his family, his wife and daughters being the first white women to stand on the banks of the Kentucky. Early in 1778, Boone and thirty companions left the settlement to procure a supply of salt, and all were captured by a band of Shawnee Indians. Boone was carried to Detroit by his captors, and was finally adopted by a Shawnee chief. Pretending to be highly pleased with Indian life, he was given considerable liberty, and so was able to escape when he learned of an intended raid on Boonesboro.

He made the perilous journey of 160 miles back home in four days, reached there in time to give warning to the settlers, and he bore a

conspicuous part in repelling the attack. Boone then removed with his family to North Carolina, but returned to Kentucky in 1780. His services as guide and surveyor were in great demand, and he represented the settlers in the legislature and acted as sheriff and county lieutenant of Fayette County. However, his carelessness in securing clear titles for his land holdings caused him to lose all that he possessed, and in 1790 he moved his family to Point Pleasant, Va. (now W. Va.).

Five years later, they settled in Spanish territory, about forty-five miles west of Saint Louis, where Boone was appointed commander of the Femme Osage district. The Spanish authorities made him a land grant of about 845 acres, but when the territory passed to the United States through the Louisiana Purchase, he lost it all. In 1810, however, Congress confirmed the grant in recognition of the services of the man who had

"opened the way for millions of his fellow men."

Boone died September 21, 1820, and was buried in Missouri, but in 1845 his remains, with those of his wife, were transferred to Frankfort, Ky., where a monument has been erected to his memory. In 1915 the Daughters of the American Revolution of North Carolina, Tennessee, Kentucky, and Virginia completed a marking of the Boone trail through the four states mentioned. The first marker was placed at Boone's early home, on the Yadkin in North Carolina, and the trail ends at Boonesboro. This task, lasting four years, is representative of the place that Daniel Boone occupies in the hearts of his countrymen—that of the typical American pioneer. See illustration of Boone monument, in the article KENTUCKY.

BOONE, IA. See IOWA (back of map).

BOÖTES, *bo oh' teez*, "THE HUNTSMAN," is a constellation in the northern hemisphere.



DANIEL BOONE

Photo Brown Bros.

In the article **ASTRONOMY** (The Heavens in Spring and Summer), Boötes is pictured in its position near the Great Bear, or Dipper. It contains Arcturus, one of the brightest stars visible in the northern heavens. In ancient mythology, Boötes represents Arcas, the son of Callisto. With his dogs he hunted, and would have killed his mother, the Great Bear, but for the intervention of Jupiter. F.B.L.

BOOTH, the name of a family originally English, which produced several well-known actors. One of them was for years the acknowledged leader of the American stage; another, the misguided slayer of the greatest man of his age.

Junius Brutus Booth (1796-1852) made his first appearance on the London stage in 1815, at the Covent Garden Theater. There he won great popularity in the rôle of Richard III, and later as Iago to the Othello of Edmund Kean, at the Drury Lane Theater. After 1821 he acted chiefly in the United States, where he was enthusiastically received and held in high esteem as a tragedian, especially in the rôles of Richard III, Lear, Shylock, Hamlet, and Iago.

Edwin Thomas Booth (1833-1893), son of Junius Brutus, became one of the most distinguished actors on the American stage. He was born in Bel Air, Md., and his acting career began in 1849 in Boston. Two years later, he played his father's rôle of Richard III, in New York City. His numerous tours of the United States, Australia, and Europe were uniformly successful, and he became known as the leading American tragedian of his generation. His most admired acting was in Shakespearean plays, especially in the rôles of Hamlet, Shylock, Richard III, Lear, and Othello. Though not imposing in appearance, he was dignified and graceful, and his marvelous voice could express the finest shades of feeling. Booth was a man of intellectual distinction and fine artistic gifts.

John Wilkes Booth (1839-1865), the younger brother of Edwin, is remembered only as the assassin of Abraham Lincoln. He abandoned the stage in 1863, after several years of acting in which he was only moderately successful. His intense sympathy for the Southern cause led him to form a conspiracy, with others, that brought about the murder of President Lincoln. On the evening of April 14, 1865, he entered Ford's Theater, in Washington, where Lincoln was sitting in a private box, and shot him. Shouting "*Sic semper tyrannis*" ("So be it ever to tyrants"), he leaped to the stage below, and, though he had broken his leg in the fall, he made his escape through a back door, mounted a horse that was held in waiting, and fled to Virginia. At Bowling Green he was overtaken, and, hiding in a barn, was shot after he refused to surrender. His mad act shocked

the South almost as much as it did the North. See **LINCOLN, ABRAHAM** (Victory and Death).

BOOTH, the name of a family famed for activity in religious work, in connection with the Salvation Army and Volunteers of America (which see).

William Booth (1829-1912), founder of the Salvation Army, was born at Nottingham, England. He adopted the faith of the Wesleys at the age of fifteen, but later joined the Methodists and was ordained a minister; he left that body in 1861, in order to carry on the preaching of the Gospel in a way he had made peculiarly his own. In 1855 he had married Miss Catherine Mumford, who was heartily in sympathy with his methods. In 1864 they began evangelistic work in London, holding open-air meetings and striving to brighten the lives of the forlorn in the East End of the city. The converts were organized by Booth into a mission band, and from this developed the great semi-military organization that in 1878 received the name of Salvation Army.

Since that time the Army has extended its influence over all the world, and its open-air meetings, processions, stirring music, and the zeal and self-denial of its workers are known to all. General Booth was wholly devoted to the work. He wrote many of the hymns sung in the Army meetings, and the weekly paper of the organization, the *War Cry*, was founded by him. In *Darkest England*, the best-known of his books, presents his idea of how to deal with poverty and vice. Though ridiculed and violently opposed at the beginning of his labors, General Booth came to enjoy the highest respect, and in 1902 was honored by an invitation from Edward VII to be present at the coronation ceremonies. His sons and daughters were his trained assistants, and on his death the leadership passed to his son Bramwell.

Bramwell Booth (1856-1920), son and successor of General William Booth, was born in Halifax, England, and educated in private schools. He took an active part in the work of the Army from the time he was eighteen, and in 1880 he was appointed chief of the staff. In 1896 his younger brother, Ballington, left the Salvation Army to form a separate organization, and thereafter General Booth relied upon his son Bramwell more and more for advice and cooperation, and named him in his will for the position of commanding officer. This post he held until 1920, when he was succeeded by Edward J. Higgins.

Ballington Booth (1859-), second son of William Booth, and the eventual organizer of the Volunteers of America, was born in London. In 1886 he married Maud Charlesworth, and the following year they were sent to America to take charge of the Salvation Army work in the United States and Canada. Because of a disagreement with General Booth concerning methods to be followed, they left the Army in 1896 and founded the new organization above named. The general methods of the Volunteers of America are similar to those of the Salvation Army, but the Volunteers make a special effort to work with the various churches.

Maud Ballington Charlesworth Booth (1865-), wife of Ballington Booth, was born near London, and was the daughter of a wealthy clergyman of the Church of England. At the age of seventeen, she went to Paris with Miss Catherine Booth, a daughter of General Booth, and they organized a branch of the Salvation Army in that city. Two years later, she

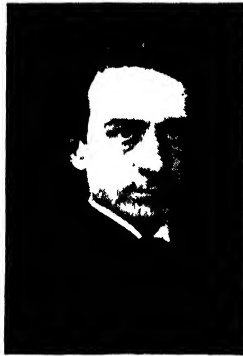


Photo: Brown Bros
EDWIN BOOTH

accompanied a band of workers to Switzerland, where her zeal and activity caused her to suffer imprisonment. After her marriage to Ballington Booth, she took her husband's rank of marshal, and was his co-worker in the organization of the Volunteers of America. She became known throughout the United States for her helpful service in behalf of prisoners, both before and after their release.

Frederick Saint George de Latour Booth-Tucker (1853-1920), who succeeded Ballington Booth in the leadership of the Salvation Army in the United States at the time of the latter's defection, was born in Bengal, India. He was educated for the civil service of British India, and held positions in the Punjab until 1881, when he resigned to join the Salvation Army. In 1882 he established the Army work in India, and was in charge of it until 1891, in that year becoming foreign secretary of the Salvation Army headquarters in London. In 1888 he married Emma Ross Booth, a daughter of William Booth, and at that time added the name of Booth to his own name, Tucker.

In 1904 he resumed his work at the London headquarters of the Army; his post of chief of the Army in America was taken by Evangeline Booth. In 1907 he returned to India as special commissioner of the Army for India and Ceylon.

Evangeline Booth, daughter of William Booth, was born in England, and was educated in the arts and in medicine. For five years she was in charge of field work of the Army in London, and then was transferred to the Canadian field. When the Klondike gold rush occurred in 1898, she organized Salvation Army work in that northern region. When Booth-Tucker relinquished command of the Army in the United States in 1904 to return to London, she became head of the American organization. Miss Booth composed the words and music of many of the songs that are popular in the Army.



Photo: Brown Bros

MAUD BALLINGTON BOOTH



Photo P & A

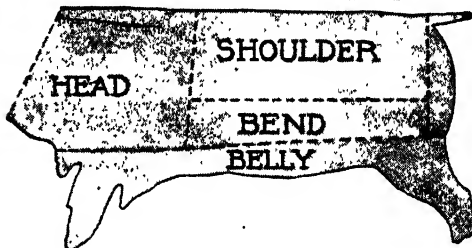
EVANGELINE BOOTH

BOOTLEGGING. See SMUGGLING.

BOOTS AND SADDLES. See BUGLE.

BOOTS AND SHOES. In the far-distant past of human history, our ancestors were aware that travel with unprotected feet was a painful matter. Probably as soon as they reached the stage of using tools of any kind, they looked about for means of covering their

feet. The animals which provided them with food were made to render still further service. From animal skins, garments to protect the body were made, and it was but natural that, from skins of the same kind, strips should be torn and wrapped around the feet. Such was probably the origin of the first foot covering, from which was evolved the sandal, the earliest form of shoe of which we have knowledge. The sandal was merely a piece of untanned skin, covering the sole of the foot only, and tied above by thongs. As the sandal became a thoroughly established article of wear, it was naturally improved, and fashion, even in remote times, decreed the manner of its con-



QUALITIES OF LEATHER

The skin on the bend is the firmest part; the shoulder, head, and belly are next, in order.

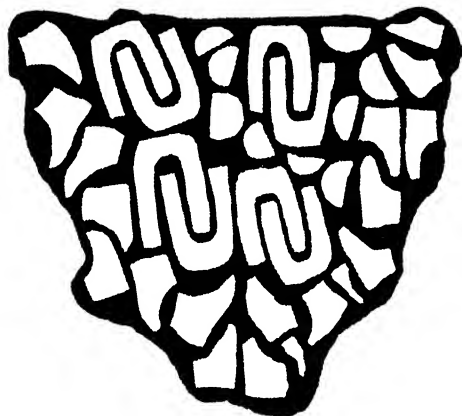
struction (see illustration, in article FOOT). Covering for the sole was not found sufficient for all purposes, so the boot was gradually evolved.

From Ancient to Modern Forms. The Egyptians of ancient days wore sandals of woven papyrus or grass, a custom which yet prevails in many parts of China, India, and other Eastern countries. The Romans wore sandals, the soles of which were sometimes protected by metal plates. Shoes shaped out of a piece of wood are now worn in parts of France, where they are called *sabots*. The same kind of shoe, known as a *clog*, is the favorite footwear of the mill workers of Yorkshire and Lancashire, England. In the Middle Ages, boots began to assume most fantastic shapes. They were made with wide flaps coming well above the knee, the leather was embroidered and highly ornamented. At one time, the upward length of a man's footwear signified his rank.

In modern days, men and women often take pride in small feet. This was not so in France in the latter part of the seventeenth century. At that time, a member of a royal family wore shoes two feet and a half in length; a baron could not have more than two feet of shoe; a mere knight had to be content with eighteen inches of foot covering. The long, pointed toes of such boots were usually looped up and tied at the knee. The boot in all its shapes is fast giving place to the more rational shoe of

to-day, which reaches just below or somewhat above the ankle. In the lumber camps of the United States and Canada, a boot reaching to just below the knee and often called a *shoepack*, is worn. The British horseguards still wear the *jackboot*, which comes above the knee; this boot may be regarded as the father of all modern forms of boot. In England, it is still customary to call a shoe reaching just above the ankle a boot, a shoe being one which is of a lower cut.

The Industry in America. The shoemaking industry was introduced into America in 1629, when Thomas Beard, a shoemaker, arrived with a supply of cowhides on the *Mayflower's* third voyage across the Atlantic. Within a few years from that time, the town of Lynn, Mass., then a primitive settlement, became the center of the shoe trade. For many years,



CUTTING LEATHER

Showing how patterns are laid to prevent waste in stock

however, journeying shoemakers continued to travel from farm to farm, making shoes out of the hides provided by the settlers. Comfort and utility were more sought in those days than style and appearance.

The boot and shoe industry in America had its beginning in Massachusetts, and that state still leads in this business. Lynn makes more women's shoes than any other city in the world, and Brockton enjoys the same supremacy in the manufacture of men's shoes. After Massachusetts, in order of rank, is New York, New York City being the producing center in that state. New Hampshire, Pennsylvania, Missouri, and Ohio are important states in this branch of manufacture.

The shoe industry in the United States developed remarkably during the years following the World War, when European markets were large consumers, until a peak of production of more than 350,000,000 pairs was reached in a single year. Shoes of American manufacture are now worn in fifty countries. The actual

number of factories has been reduced by consolidation in recent years.

Since the outbreak of the World War, styles of women's shoes have undergone many changes. The high shoe, laced or buttoned, and reaching above the ankle, has been practically superseded for general and dress wear by the low shoe. There has also developed a wide vogue for shoes to match the costume. Footwear is now marketed in a wide variety of colors, and use is made of satin and velvet, as well as dressed leather.

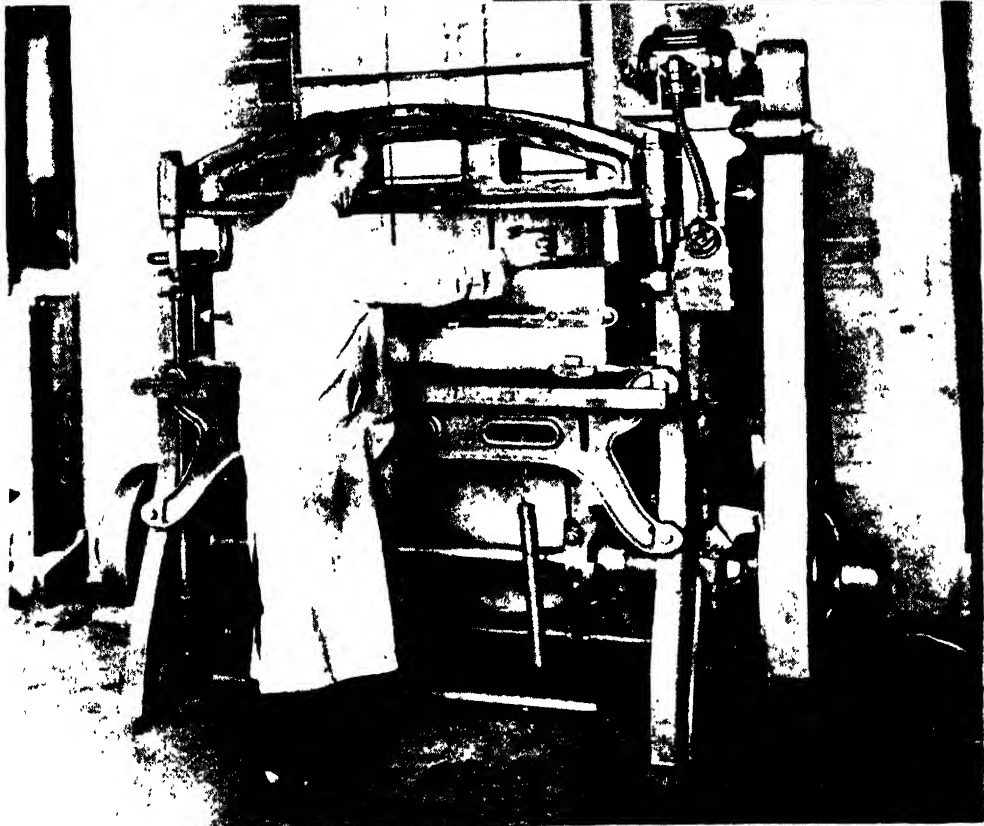
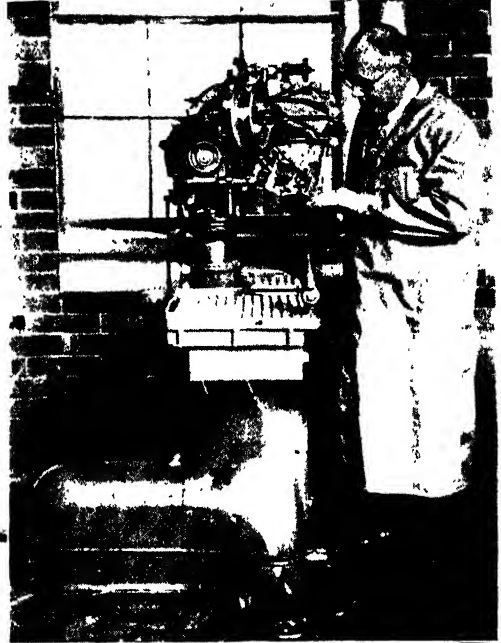
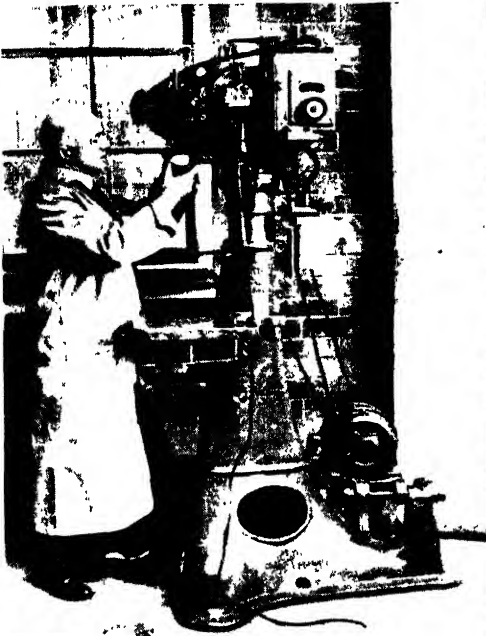
Shoemaking in Canada. The shoemaking industry is of great importance in all Canadian cities, but it has not yet been sufficiently developed to meet all the requirements of the market. Boots and shoes are imported from the United States and England, eighty per cent of these importations coming from the United States.

How Modern Shoes Are Made. In the making of a modern shoe, the hide undergoes more than 100 processes before it comes out of the factory as a finished product. The first process is that of *tanning*. This is done by soaking the hide in chemical solutions, which change the nature of the skin and turn it into leather (see TANNING). The modern shoe consists of a *sole* and *upper*; these are also divided into several component parts.

Cloth is not so frequently used for the tops of shoes as in former days. In some cases, a rubber composition has been found satisfactory for soles. The greater portion of the leather shoes made in the United States are by the process called Goodyear welt. Others are known as McKay sewn, screw, or metallic fastened, stitched down and turned. By far the greater number of shoes sold now are made almost entirely by machinery, and so perfect has that machinery become that a pair of shoes can be completed in less than a quarter of an hour.

BORACIC, *bo ras' ik*, ACID, OR BORIC ACID, one of the compounds of the element boron, is widely used in medicine and surgery, and in manufacturing and the arts. It is a white crystalline solid, soluble in water, and is a mild antiseptic. It is used in a four per cent solution for eyewashes and sprays for the nose and throat; in lotions or ointments, it is applied to non-dangerous cuts and other accidental wounds, and to chapped hands. It is also a remedy for freckles. Some physicians prescribe boracic acid for epilepsy. In the arts and in industry, it is employed in making glazes for pottery and in enamel work, and except where pure-food laws forbid it, finds some use as a preservative of meat and some other foods.

An important source of supply is the steam that issues from crevices in the ground in parts of Tuscany. The steam is passed through water, which collects the boracic acid; the



Photos U & I

Vast Quantity Production by Machinery. Here are some of the devices that have supplanted the work of the cobbler (1) Goodyear welt-sewing machine. (2) An intricate side-lasting machine. (3) The operator is shown cutting soles for boots and shoes.

water is then evaporated by the use of volcanic heat, and the acid forms into crystals. It is purified by reheating, and when again cooled, appears as white, flaky crystals. Boracic acid is one of the chief constituents of borax. See BORAX.

[For a remedy for boracic-acid poisoning, see ANTIDOTE (Borax).]

BORAH, WILLIAM EDGAR (1865-), an American statesman, a Republican with strong progressive leanings, elected repeatedly to the United States Senate from the state of Idaho. He was born in Illinois, was educated in the University of Kansas, and was admitted to the practice of law in Lyons, in that state. After 1901 he made his home in Boise, Idaho.

Borah aspired to election to the Senate in 1902, but was defeated. In 1907 a second effort was successful, and he has been returned every six years practically without opposition. In the Senate, he became a leader; he rose to the chairmanship of its most important committee, that of Foreign Relations. It was his belief that the heaviest rate of income taxation should fall upon the rich; he voted for the woman-suffrage amendment; he championed the prohibition amendment; and he violently opposed American membership in the League of Nations and the World Court. Independent in thought and action, he frequently challenges the policies of his party. In 1929, President Hoover offered him the post of Attorney-General, which he declined.

BORAX, *bo' raks*, the most important salt of the element boron. It is known chemically as sodium tetraborate, and is usually seen in the form of white crystals which dissolve in water, giving a solution of alkaline reaction.

Borax is used for many purposes, as in the manufacture of colored enamels and glazes for porcelain, and in soldering and welding, since it dissolves the oxide on the surface, and thus gives clean surfaces of the metal to stick together. It is employed to some extent in preserving butter, soft cheese, canned meat, fish, and other foods. Whether in the quantities used for food preservation it is injurious to health is a disputed question. Some soaps and washing powders contain borax, which, like soda, softens hard water. In the laundry, borax is used to soften water and to enhance the gloss of starch in ironing. It is

employed to some extent in the textile industries and in medicine.

When borax crystals are heated in a loop of platinum wire, they swell up greatly, owing to the boiling out of the water. When the bubbling ceases, a clear, glassy liquid remains, which combines with many metallic oxides, giving "borax beads" of various colors. In mineralogical and chemical analyses, these beads are used to detect the presence of certain metals. Thus cobalt gives a blue bead; copper and nickel, green; and manganese, amethyst.

Borax is now obtained chiefly from deposits of *kernite*, a mineral discovered in 1926 in the Mohave Desert, California; the deposit, which is the only one known in the world, is three or four hundred feet below the surface; it is one hundred feet thick, and extends at least 500 feet in all directions.

Kernite is sodium borate, seventy-five per cent pure; its crystals contain four molecules of water. It is dissolved in water, the impurities are filtered off, and the borate allowed to recrystallize. In the refining process, six molecules of water are added, and the result is marketable borax. This ease of manufacture and the nearness of deposits to transportation make it impossible for other sources of borax to continue to compete with kernite. These other sources are the famous Death Valley of California; Tibet, which furnishes an impure variety called *timcal*; and Italy where large quantities are made from boric acid, by boiling the acid with carbonate of soda. T.B.J.

Chemical Formula. The formula for powdered borax is $\text{Na}_2\text{B}_4\text{O}_7$; that is, a molecule consists of two atoms of sodium, four of boron, and seven of oxygen. Borax crystallizes in prisms containing ten molecules of water, and the formula for borax crystals is therefore $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$.

BORDEAUX, *bawr doh'*. See FRANCE (Interesting Cities).

BORDEAUX, a wine. See CLARET.

BORDEN, SIR ROBERT LAIRD (1854-), a Canadian statesman who became Premier of the Dominion in 1911. He was born in the village of Grand Pré, N. S., June 26, 1854.

Borden was the recognized leader of the Nova Scotia bar when he was persuaded, in 1896, to offer himself as a candidate for the Dominion House of Commons. He was elected as one of the members for Halifax. In Parliament in 1901, he was chosen to succeed Sir Charles Tupper as leader of the Conservative opposition. This honor came unsought to him. The first important issue he had to face arose out of the question of establishing provincial governments in the western territories. Under the territorial government, the Roman Catholics had secured the right to maintain separate schools. Sir Wilfrid Laurier undertook to preserve this right in the new provincial constitutions. Borden, on the other hand, took



Photo. U & U

WILLIAM E. BORAH

the position that the control of education was a provincial matter. This attitude cost him for a time the support of the French-Canadians. The result of this and other criticism was the loss of his seat in the House of Commons at the general elections of 1904. Borden was then inclined to withdraw from public life, but he was persuaded to accept the representation of an Ontario district, and to retain party leadership.

In the general election of 1908, Borden regained his seat for Halifax, and continued to lead the opposition in the House of Commons until 1911. In the elections of that year, other issues were gradually subordinated to that of reciprocity with the United States, a policy which Borden vigorously opposed, for patriotic, rather than economic, reasons. As the elections resulted in a decisive victory for the Conservatives, Borden was naturally called upon to form a Ministry, and held office from 1911 to 1920. In 1912 he was appointed to the Imperial Privy Council, and in 1914 was created Knight Grand Cross of the Order of Saint Michael and Saint George. See CANADA (History). G.H.L.

BORE, the name of a tidal wave which rushes up the estuary of a tidal river or a narrow arm of the sea at spring tide. It varies from three to ten feet in height, moves with irresistible force, and wears away the banks and bed of a stream. Vessels sometimes find it impossible to make headway against its strong current. Some of the places where this wave is especially prominent are the Bay of Fundy, the Amazon River, the estuaries of the Seine, the Severn, and the Dee rivers. See TIDES (Spring Tide). R.H.W.

BOREAS, *bo' re as*, in Greek and Roman myths, one of the six sons of Aeolus, god of the storms and winds, and of Eos (Aurora), goddess of the dawn. Boreas personified the north wind; in classic writings he is called boisterous and blustering, and is regarded as the type of rudeness, in contrast to his youngest brother Zephyrus, the west wind, who is the type of gentleness. The origin of the term *zephyr*, applied to mild breezes, is thus explained. Aeolus sometimes sent his sons forth with orders to stir up terrible storms on the sea; the part that Boreas had in this gigantic frolic of the gods is picturesquely described by Lucan, a Roman poet:



Photo U & U

SIR ROBERT BORDEN

The curling surges loud conflicting meet,
Dash their proud heads, and bellow as they beat;
While piercing Boreas, from the Scythian strand,
Plows up the waves and scoops the lowest sand.

It is told by the myth-writers that Boreas loved the nymph Orithyia, but that he could not woo her successfully because it was so difficult to breathe gently, and to sigh was quite out of the question. Finally, in despair, he seized her and bore her away to far-distant regions of snow and ice, where she became his wife. They were the parents of two sons and two daughters. The former, Zetes and Calais, were winged warriors who took part in the expedition of the Argonauts (which see).

Modern Application. The use of the term *Boreas* as a symbol of the north wind occurs frequently in modern literature, as in the familiar line of Burns "Cauld Boreas, wi' his boisterous crew." See MYTHOLOGY; AEOLUS.

BORGHESE, *bor ga' ze*, a celebrated aristocratic family of Italy, originally of Sienna and later of Rome. In the latter city was born Camillo Borghese (1550-1620), who was elected Pope as Paul V in the year 1605. Prince Camillo Borghese (1775-1832) was another well-known member. In 1803 he married Pauline, the sister of Napoleon, and three years later, having received the title Duke of Guastalla, was appointed governor of the provinces of Piedmont and Genoa. After the fall of Napoleon, he severed all connection with the Bonaparte family, separated from his wife, and retired to Florence, where he died.

Borghese Palace, the town residence of the Borghese family, is yet one of the finest buildings in Rome. It was begun in 1500, and was completed in 1607. At one time it contained a valuable collection of art treasures, these were sold at public auction in 1892 by Prince Paolo Borghese, at the same time, the important family records were acquired for the Vatican by Pope Leo XIII. The palace still possesses, however, a famous collection of paintings, numbering nearly six hundred. Among these are a *Madonna* by Botticelli; four paintings by Raphael, including the *Burial of Jesus*; Titian's *Sacred and Profane Love*; and Correggio's *Danaë*.

BORGIA, *bor' ja*, a powerful Italian family of Spanish origin, prominent in the fifteenth and sixteenth centuries, some of whose members established reputations for wickedness and treachery. The first to gain prominence was ALFONSO BORGIA, who became Pope as Calixtus III, in 1455. His nephew, RODRIGO BORGIA, was elevated to the Papacy in 1492 as Alexander VI. While cardinal, he became the father of a large family whose most notorious members were Cesare and Lucrezia. See ALEXANDER (Pope).

Cesare, or **Caesar**, **Borgia** (1457-1507) was the favorite son of his father, whose power aided him in his career. He was clever, but appeared to be without

conscience. He attempted to establish an hereditary monarchy in Central Italy, but his methods were so unscrupulous and gained him so many powerful enemies that upon the death of his father, in 1503, his ambition failed completely. After two years' imprisonment in Spain, he escaped to the king of Navarre, in whose service he was killed in battle in 1507.

Lucrezia Borgia (1480-1519), the sister of Cesare, was a woman of great beauty and charm, but in her early years she was as wicked as she was beautiful. Her first marriage was annulled; her second husband was murdered by Cesare. After she became the wife of the Duke of Ferrara, her life was above reproach. She was a patron of learning and the arts.

BORGLUM, *bawr'-glum*, GUTZON (1867-), one of the foremost American sculptors, whose work is noted for its power, its simplicity, and its half-concealed disregard for convention. He shows strongly the influence of Rodin (which see), and, like Rodin, reveals imagination through a splendid technique. He has also won distinction as a painter, but in later years, he deserted the palette for the chisel.

Borglum was born of Danish parents, in Idaho. After a brief period of studying in San Francisco, he spent a number of years in Paris and London. Since 1902 New York has been his home, and his most important pieces of sculpture are in the United States. Among them are *Mares of Diomedes*, in the Metropolitan Museum, New York; a series of statues for the Cathedral of Saint John the Divine, in the same city; the colossal head of Lincoln, in the rotunda of the Capitol at Washington, D. C.; the imposing seated figure of Lincoln, in Newark, N. J.; statues of Philip Sheridan and James Smithson, in Washington, and a new Gettysburg memorial for the battlefield.

What was to have been Borglum's greatest work was lost to him. Plans were completed in 1915 for the transformation of Stone Mountain, sixteen miles from Atlanta, Ga., into a great Confederate Memorial—a "memorial

to a movement," in Borglum's own words (see *STONE MOUNTAIN*). In 1925 Borglum was dismissed through a political quarrel, after a colossal head of General Lee had been completed, and other sculptors, under Augustus Lukeman, will finish the work. In 1927 Borglum was commissioned to place on Mount Rushmore a gigantic memorial. See *MOUNT RUSHMORE MEMORIAL*.

His brother, **SOLON BORGLUM** (1868-1923), also a distinguished sculptor, perpetuated in stone and bronze the life of the Western frontier. Cowboys, ranchmen, Indians, and especially horses, were his favorite subjects. Unlike that of his brother, his work shows practically no foreign influence.

BORI, *bo' re*, **LUCREZIA** (1888-), a soprano singer of striking personality, remarkable voice, and high dramatic gifts. She is a native of Valencia, Spain. Her musical education was completed in Rome and in Milan; she made her debut in *Carmen* in 1908. Since then her voice has charmed music-lovers in all the centers of grand opera in Europe and in Argentina, and since 1921, in the United States, as a member of the Metropolitan Opera Company of New York. She has won great favor as a radio entertainer on occasions of unusual moment and has made new friends in the Chicago area by her singing in summer opera at Ravinia Park.

Miss Bori's principal rôles include the *prima donna* parts in *Love of Three Kings*, *Pagliacci*, *La Traviata*, *Rigoletto*, *Faust*, and *Manon Lescaut*.

BORING MACHINES, for making holes in all sorts of material, vary from simple hand instruments to complex, power-driven devices. Among the former, the *awl* acts on the principle of a nail, pushing its way directly in, while the *auger* and *gimlet* resemble the screw. A *bit* and *brace* is provided with a handle called the *brace*, which may be held upright with one hand and turned with the other, so that the



GUTZON BORGLUM

Photo Brown Bros.

Posed before an unfinished bust of Abraham Lincoln.

bit, or removable cutter, bites into the material to be pierced.

Boring instruments for piercing stone and metal are called *drills*. These are of many kinds, and are usually operated by steam, electricity, or compressed air. In boring small holes in rocks for blasting purposes, a steel drill, somewhat like a chisel, is used, the head of the drill being struck by a heavy hammer. In all boring operations requiring a deep hole, a diamond drill is used. This consists of a hollow steel cylinder on the end of a shaft which is turned by steam or electric power. The actual cutting is done by black-diamond teeth, which bite into the rock and remove a core, which is brought to the surface in the cylinder.

For boring holes in steel plates, bridge girders, and other iron and steel structures, tools operated by compressed air are much employed. The air is directed from a supply tank through rubber tubes to the tool, which works with great rapidity and with but little waste of power. See COMPRESSED AIR.



LOCATION OF BORNEO

B, British section; D, the Dutch possession.

BORIS III (1894-), king of Bulgaria, in succession to his father, Ferdinand, who abdicated in favor of the son in October, 1918, after his country had met defeat in the World War. Boris was born in Sofia, and was educated in his native land. He entered the army and learned military arts

under his father and leading Bulgarian generals. He is conservative, and of a naturally retiring disposition. See BULGARIA (History).

BORNEO, *bawr' ne o*, the third largest island in the world, only Greenland and New Guinea exceeding it in size (Australia being classed as a continent). It is situated southeast of Asia, in the Malay, or East Indian, Archipelago, about 400 miles east of Singapore, and is surrounded by the China, Java, and Celebes



Photo Visual Education Service

DYAKS IN FULL DRESS

seas. Its area is 289,860 square miles, less than half the area of Alaska, and nearly that of the province of Alberta. By far the largest and most valuable portion of the island is under Dutch rule, the remainder being divided into three small states, which are under British protection. The area of the British section is 83,150 square miles, of the Dutch, 206,710 square miles.

For the most part the island is mountainous, the highest peak being 13,698 feet above sea level. The rivers are a most important feature, as they form the main arteries of internal commerce, several being navigable for more than 100 miles.

The climate is hot and moist, and the humid lowlands are unhealthful for Europeans. The soil is very fertile; it produces spices, potatoes, yams, cotton, tobacco, and many kinds of tropical fruits. Sugar cane is extensively cultivated, and groves of sago palms abound; these furnish a valuable source of food to the natives. There are extensive forests

of teak and ironwood, and almost inexhaustible supplies of other valuable timber. The water buffalo, the usual beast of burden, is used for plowing and for drawing native carriages, and



Photos, Visual Education Service

"HOME, SWEET HOME" IN BORNEO

There is little variety in architecture among the natives. Below is shown a typical residence; above, the entire family posed for a photograph in front of the home.

it is also ridden; horses and automobiles are owned only by the European inhabitants and a few of the richest natives.

The mineral wealth of the island is very great, but mining operations are carried on under difficulties. Gold, coal, iron, tin, sulphur, and mineral oils are found, and diamonds have been discovered in many places. The diamonds of Borneo are inferior to those of Africa, for they are of a yellowish tinge. Edible birds' nests (which see), found in great numbers in the caves and cliffs on the coasts, form an important article of commerce. Gutta-percha, trepang, rattan, and timber are exported in large quantities.

The most highly civilized of the native inhabitants are Malays from Java, Sumatra, and other East Indian Islands, and Bugis from Celebes. In the northern part, there are Sulu types from the Philippine Islands. The head-hunting Dyaks of the interior still believe in nature worship and idolatry (see DYAKS). The Malays are mostly Mohammedans; they are the principal merchants and traders, and are also noted as bold sailors. Chinese are numerous, especially in mining districts, where they toil incessantly to accumulate enough money to allow them to return home to live in comfort. The natives wear costumes of bright and gaudy colors. The women excel in weaving cotton fabrics and in making mats of beautiful designs and coloring. Population, British section, 258,000; Dutch possessions, 1,234,000.

BOROUGH, *bur' o*, in some states of the American Union, an area incorporated for the administration of municipal government. In general, it corresponds to what in most states is a city or incorporated town. Greater New York has five boroughs.

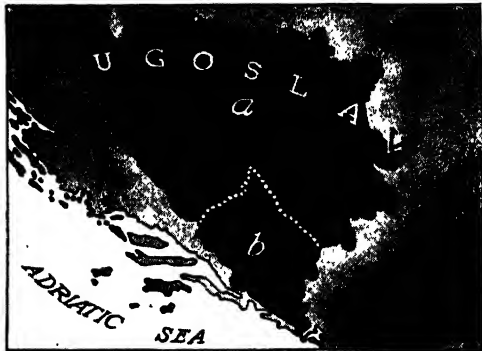
In England and Scotland, a borough includes the constituency which elects a member to Parliament. The word originated in early English history, and from the date of its first use possessed about the same meaning it has to-day—a market place, with its own government and courts.



BORUSSIA, *bo ru' shah*, ancient home of the Letts (which see).

BOSIO, *haw' zyoh*, JOSEPH. See SCULPTURE (France).

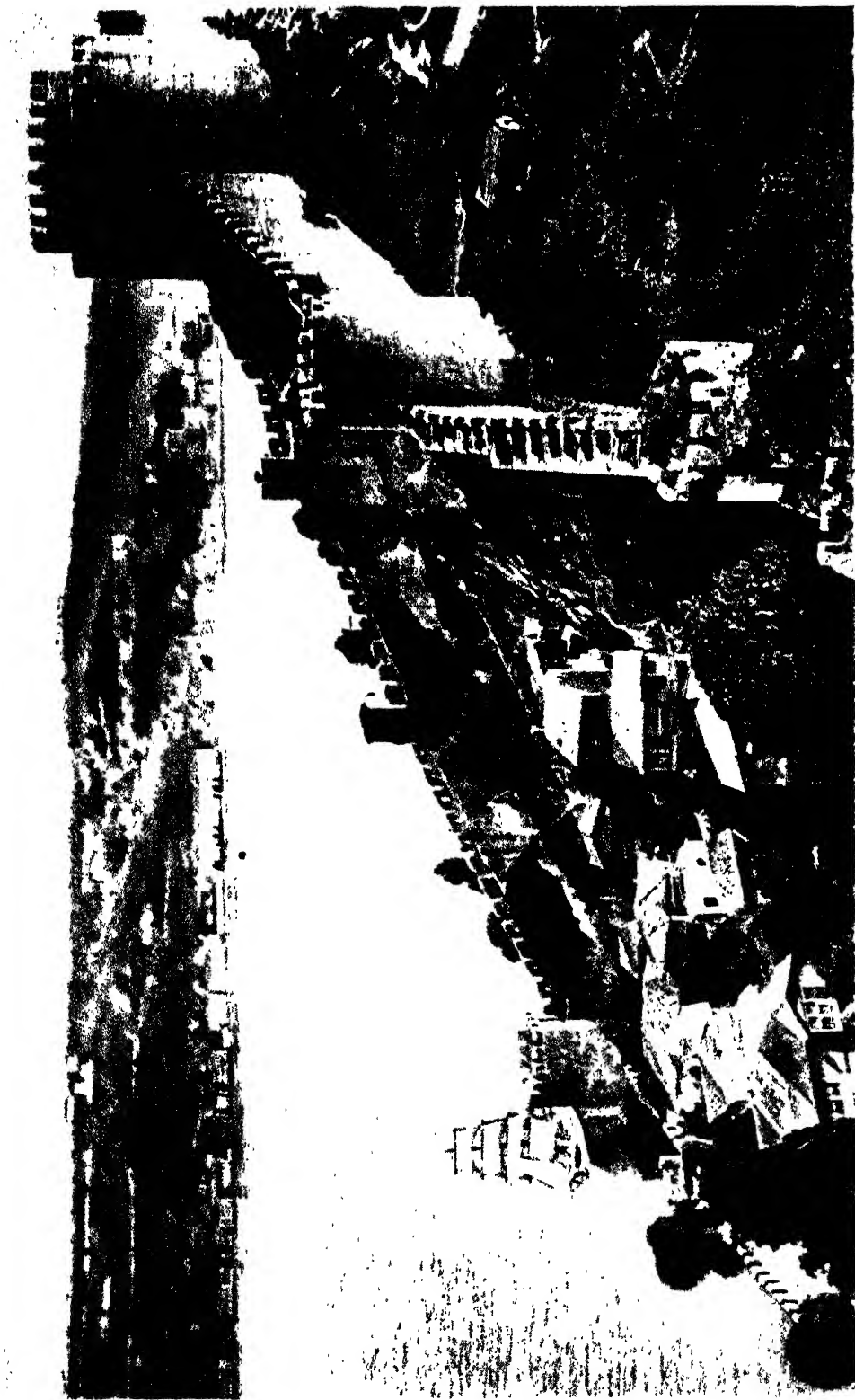
BOSNIA AND HERZEGOVINA, *hur tse go-ve' nah*, since 1918 a province of Yugoslavia (formerly called the Kingdom of the Serbs,



LOCATION MAP

(a) Bosnia; (b) Herzegovina.

Croats, and Slovenes). Previous to 1878, Bosnia and Herzegovina were provinces of the Turkish Empire, but because of Turkish misrule, the Great Powers authorized Austria-Hungary to govern them, after Turkey's defeat



A Picturesque Architectural Relic of Bygone Times Imposing Byzantine towers overlooking the Bosphorus at Constantinople, the last Turkish stronghold in Europe

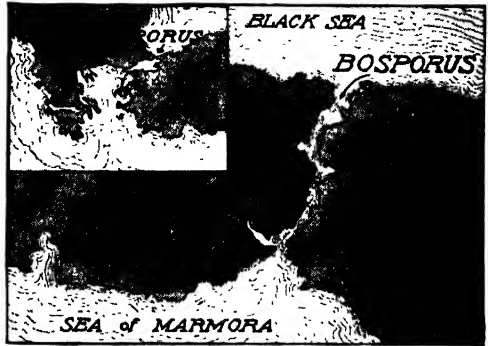
in the Russo-Turkish War (see BERLIN, CONGRESS OF).

In 1908, Emperor Francis Joseph of Austria-Hungary proclaimed the annexation of the provinces, and they became a self-governing territory within the Dual Monarchy. The annexed territory had its own legislative body, with lawmaking power in local affairs, but it possessed no representation in the central Parliaments. Its inhabitants, who belong to the Serbo-Croatian group of Slavic peoples, were restive under their enforced submission to the Austrian crown, and the Serbian elements, especially, looked toward a union with Serbia. It was in Serajevo, the capital of Bosnia, that the revolutionary movement culminated in the assassination of Archduke Francis Ferdinand and his wife, in June, 1914. This event precipitated the World War, which brought about the dismemberment of Austria-Hungary and the formation of Yugoslavia, by the Treaty of Versailles.

In the dual monarchy Bosnia-Herzegovina was the southernmost province, Bosnia occupying the northern and Herzegovina the southern part of the territory. In Yugoslavia, the combined provinces lie northwest of Montenegro and north and east of Dalmatia. The total area is 19,768 square miles, and the population, about 2,000,000. For industrial and geographical features, see the article YUGOSLAVIA.

BOSPORUS, *bahs' po rus*, a strongly fortified strait connecting the Black Sea with the Sea of Marmora. It is nineteen miles long, and from one-half to two miles wide. It was here, over the middle of the channel, in that place about 3,000 feet wide, that Darius constructed the famous bridge of boats on his Scythian expedition. The strait is an important commercial route, and in medieval times was the gateway for the bulk of trade between Asia and Europe. Only Turkish

warships were to be seen there, however, during the late nineteenth and early twentieth century, for a treaty, made in 1841 and confirmed in 1878, guaranteed that no war vessels should pass the Bosphorus without Turkey's



THE BOSPORUS

consent. By the Treaty of Lausanne, in 1923, the Bosphorus was internationalized, and thus opened to all nations. See LAUSANNE, TREATY OF; WORLD WAR.

The strategical value of the Bosphorus is almost equal to that of the Dardanelles (which see). During the World War, the allied fleets of Britain, France, and Italy found in the Dardanelles an impregnable barrier, keeping them from Constantinople. On the east, the Russian warships in the Black Sea could not even attempt to force the passage of the Bosphorus. The greatly coveted city of Constantinople, on the Golden Horn, was practically safe from attack by water.

Derivation. The name *Bosporus*, derived from Greek words which mean *ox ford*, was probably given because the strait is so narrow in some places as to be crossed easily by cattle; according to Greek legend, it was crossed by Io after she was changed into a cow (see Io).



BOSTON. This metropolis and capital of Massachusetts, and the county seat of Suffolk County, is the largest city in New England and the ninth in population in the

United States. Though far removed from the country's center, the old city has a unique place in the affections and patriotic sentiments of the American people. In no other American

city are there so many structures that have become memorials of the historic and literary past. No other city has so distinguished a list of citizens who have helped to shape the history of America and enrich its cultural life. On this list are the names of patriots and statesmen, orators and jurists, educators and men of letters—such names as Paul Revere, John and Samuel Adams, James Otis, John Hancock, Charles Sumner, Edward Everett, Wendell Phillips, Longfellow, Lowell, Emerson, Hawthorne, the Alcotts, Oliver Wendell Holmes, and many others. It was Holmes who referred, jestingly, in one of his *Aulocrat* essays, to the Boston State House as the "Hub of the Solar System." The name was so apt that it was adopted for the city. Even to-day almost anybody knows that Boston is meant when "The Hub" is mentioned.

Location and Size. Boston is situated on Boston Harbor, an arm of Massachusetts Bay, and at the mouth of the Charles River, 232 miles northeast of New York, and 450 miles northeast of Washington. It is in nearly the same latitude as the city of Rome. Other American cities, founded at a later date, have outdistanced Boston in population, for the reason that the original site was small, and various annexations have not extended the city limits to include all of the adjoining population centers. Municipal Boston, in fact, is the "hub" of a well settled district extending fifteen miles from the state capitol, in which thirty-nine residential and manufacturing cities and towns are independent units as to government, but are virtually parts of one municipality in respect to transport facilities, parks and boulevards, industry, and public utilities. When, in 1912, Hyde Park was annexed to the city, the area was increased to its present total of 47.8 square miles. Baltimore, the city ranking next above Boston in population, has nearly twice that area.

The Metropolitan Area, including Boston and the thirty-nine towns referred to above, is managed by a Metropolitan District Commission in regard to parks, sewers, and water supply. Water is brought from the Wachusett Reservoir, in Central Massachusetts, by means of a system of reservoirs. The state legislature also created a metropolitan planning division in 1922, in the interest of harmonious community development throughout the district.

The suburbs surrounding Boston include Cambridge, the home of Harvard University; Somerville, Newton, Lynn, Everett, Medford, Chelsea, and Waltham, thriving manufacturing cities; Brookline, one of the richest residential suburbs in America; Quincy, the birthplace of John and John Quincy Adams; and Watertown, where, in Mount Auburn Cemetery,

Longfellow, Lowell, and many other famous persons are buried. Within easy motoring distance are Lexington and Concord, scenes of the first battle of the Revolution; the lovely Berkshire Hills; Wellesley College; Salem, the birthplace of Hawthorne; historic Plymouth, Provincetown, and many other places of interesting associations.

The People. It is a noteworthy fact that Boston, so distinctly native American in its traditions, has become primarily a city of America's adopted sons and daughters. Nearly three-fourths of the people are of foreign birth or of foreign parentage. The Irish form by far



OLIVER WENDELL HOLMES WALK
One view on Boston Common

the largest foreign element, constituting nearly twenty-five per cent of the total population. The Scotch, English, and Germans are represented in smaller numbers, and before immigration laws restricted their number, there was for several years a steady influx of Italians and Russian Jews. The population increased from 748,060 in 1920 to 787,271 in 1930; in rank it was reduced from the nation's seventh city to ninth in size. Metropolitan Boston has a total of about 1,900,000 people.

General Description. A comparison of a map of old Boston with one of the present would reveal some very interesting changes. The original site of the town was a hilly peninsula of 783 acres, joined to the mainland at the south by a low, narrow isthmus, which the tides submerged at high water. The main harbor lay to the east, the estuary of the Charles River to the north and west, and on the west the river had widened into a large inner harbor called the Back Bay. Deep indentations fringed the shore line, and tidal marshes had formed about the narrow neck of land and along the river banks. Between 1850 and 1890, the marshlands and the bay itself were transformed into solid land by a filling-in and construction project that consumed whole forests of lumber, hills of gravel, and great granite quarries. The

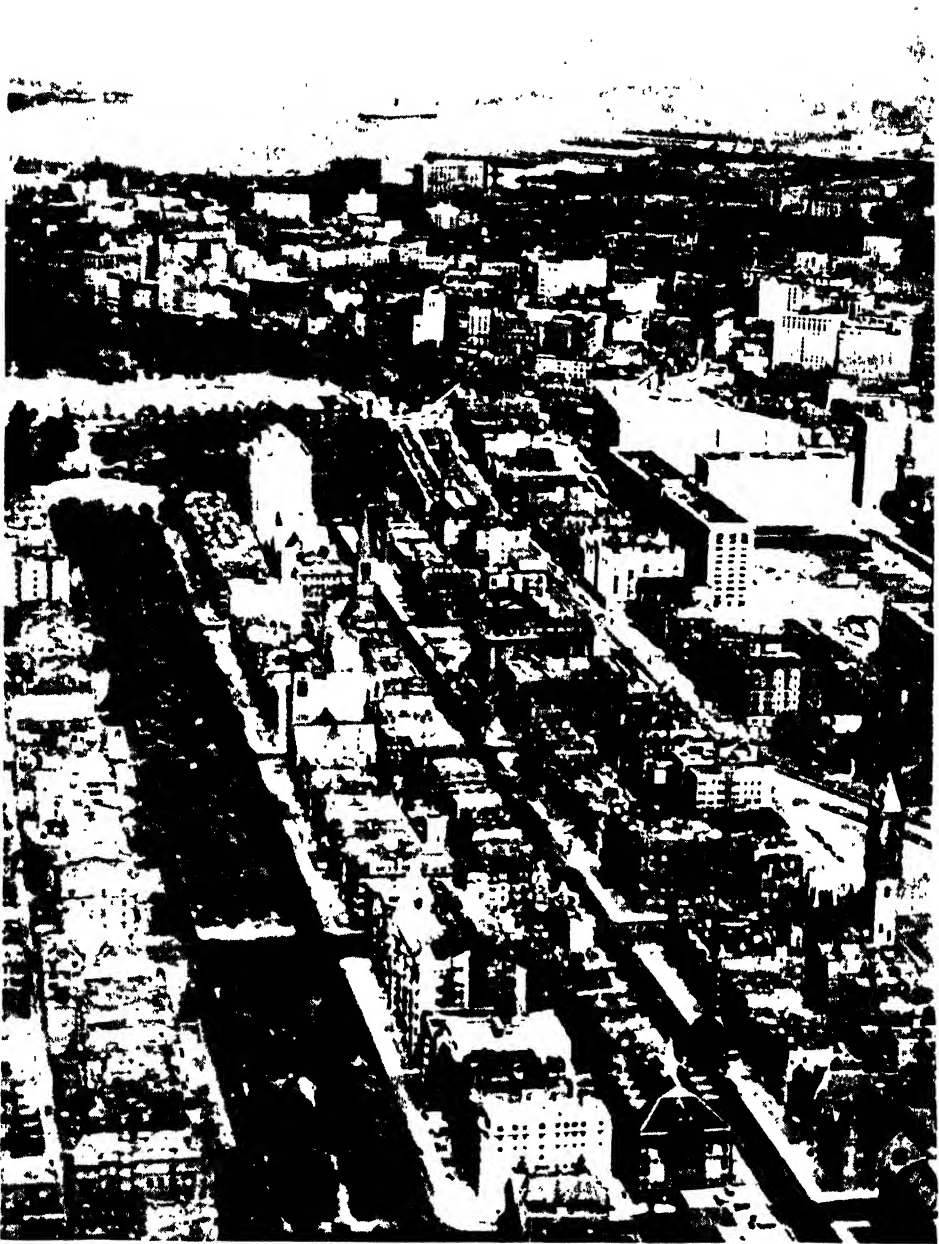


Photo Keystone

Part of Boston's Business Section. An airplane view, looking toward the bay and harbor.

isthmus was widened until it became the broadest part of the peninsula. To-day, the filled-in Back Bay district is the finest residential section of the city. Washington Street, which traverses the business section, follows the course of the highway that led into and out of the old town, and the site of the present postoffice marks the shore line as it existed when the Battle of Lexington was fought.

Between 1634 and 1637, Boston received its first addition of territory in the annexation of Noddle's and other harbor islands, comprising what is now East Boston. This section is connected with the mainland by ferries and a tunnel. In 1804 the city added Dorchester Neck, a northeasterly projection of the mainland, bounded on the west by the narrow Fort Point Channel and South Bay. This section, now known as South Boston, has the principal port facilities for ocean shipping. Washington Village, adjoining Dorchester Neck on the south, and originally a part of the town of Dorchester, was annexed in 1855. In 1868 Roxbury, a suburb to the west, was added, and in 1870 the city limits were extended to include Dorchester, which had been incorporated at about the same time as Boston and Roxbury. Four years later, Charlestown, Brighton, and West Roxbury were annexed. Charlestown, with a water front extending along the Mystic and Charles rivers and the harbor, is the site of Charlestown Navy Yard. West Roxbury contains some of the finest sections of the park system. Brighton is a continuation of the Back Bay district, and adjoins Cambridge on the southwest. Hyde Park, the last district to be annexed, lying between Dorchester and West Roxbury, is a busy manufacturing center.

Until the beginning of the nineteenth century the most conspicuous features of the landscape were the three hills—Beacon, Copp's, and Fort. Fort Hill has long since been leveled, but Beacon and Copp's hills, though considerably cut down, still remain. Beacon Hill, so called because it was used as a signal station, is about 110 feet high, and is topped by the State House, whose gilded dome is visible for many miles. The oldest part of the city, the North End, now a foreign quarter, still retains to some degree its eighteenth-century appearance, for the narrow, winding streets seem to follow the cowpaths of early days.

The commercial and industrial section of the city, adjoining the North End, also has a maze of streets that curve and double back, and some are so narrow that vehicles entering them are permitted to go only in one direction. Even Washington Street, the main thoroughfare in the retail district, is so narrow in some sections that sufficient space cannot be allowed for reasonably wide sidewalks, and at one place, of about three blocks' length, crowds of pedestrians regularly use the paved street

during the busy hours. Newer Boston, however, is a city of spacious, attractive avenues, while several street-widening projects, completed within recent years, have greatly relieved the congestion in the downtown area.

Principal Thoroughfares and Parks. The pride of the city is Boston Common, the oldest public park in America. Set off in 1634 as a place for military training and the feeding of "cattell," on the narrowest part of the peninsula, it originally extended to the edge of the Charles River Basin, but the reclamation of the Back Bay placed it in the heart of the city. Five streets enclose its fifty green acres—Tremont, on the east, a popular shopping thoroughfare; Park, on the northeast, separating the Common from Old Granary Burying Ground; Beacon, on the north, lined with dignified old houses reminiscent of the Boston of a generation ago; Boylston, on the south, noted for its fine buildings; and on the west, Charles Street, separating the Common from the Public Garden.

The Public Garden is a smaller park, attractively laid out with an artificial lake, beautiful trees, and flower plots that are brilliant masses of color in season. It consists entirely of made land, and marks the beginning of the Back Bay district. The two parks serve to perpetuate the memory of distinguished men and their deeds, for monuments and statues are numerous in both of them. Perhaps the best known is the Shaw Memorial on the Common, by Saint Gaudens, which honors Robert Gould Shaw, the commander of the first regiment of negro soldiers to serve in the Federal army during the War of Secession.

Extending westward from Arlington Street, opposite the Public Garden, is Commonwealth Avenue, one of the finest boulevards in America. It is 240 feet wide, and is beautified by a parkway through the center, widespreading trees, and several statues. Fine residences, hotels, and apartments border the avenue, which is an important link in the city park system. Another broad thoroughfare is Massachusetts Avenue, traversing the city from Dorchester to the Charles, and crossing Commonwealth Avenue eight blocks west of Arlington. Massachusetts Avenue is continued across the river to Cambridge over Harvard Bridge. The river itself is skirted on both sides for several miles by a driveway and promenade called the Embankment, or Esplanade.

The Park System. Boston's parks form a double system consisting of two concentric rings. The inner, or municipal, system was begun in 1875; including playgrounds, recreation centers, and small parks, it covers over 2,400 acres. The outer system comprises more than 10,000 acres within a radius of ten or twelve miles. From Commonwealth Avenue an unbroken chain of drives leads to Franklin

Park, a 600-acre tract in West Roxbury, forming the center of the municipal system, and to the neighboring Arnold Arboretum, the tree and shrub museum of Harvard University.



Photos Halliday Photograph Co.

OLD SOUTH MEETING HOUSE

As it now appears, surrounded by business blocks of steel and stone.

The Arboretum is connected with the Metropolitan Park System by West Roxbury Parkway, a driveway leading directly to the wooded hills of Stony Brook Reservation. South of this park is the 5,000-acre Blue Hill Reservation, containing the highest point of land on the Atlantic coast south of Maine. North of Boston is the lovely half-wild, half-cultivated tract of forest and pond known as Middlesex Fells, covering 1,900 acres.

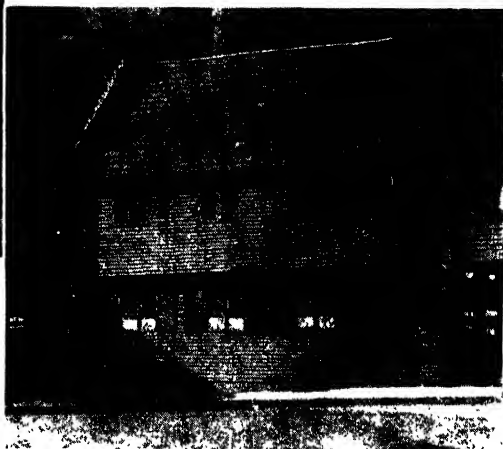
There are also many delightful reservations along the outer harbor and bay. Nantasket and Revere beaches are among the well-known pleasure grounds belonging to the outer system, and Marine Park, on the east end of South Boston, is a favorite excursion point belonging to the municipal system. It has a well-equipped aquarium, and is reached by way of Columbia Road, skirting the shore of Old Harbor. Connecting with Columbia Road, and following the shore of Dorchester Bay, is the popular stretch of drive and beach known as the Strandway.

Historic Buildings. Although many historic structures have been destroyed as a

result of the rearrangement and reconstruction of the city, the most significant of these buildings have been preserved, and they stand as perpetual memorials of things dear to American hearts.

Faneuil Hall. Probably first in interest is Faneuil Hall, popularly known as the "Cradle of Liberty." It is in the heart of the business district, at Merchants' Row and Faneuil Hall Square. The Hall was the gift of Peter Faneuil (1700-1743), a prosperous merchant, who offered to build a market house if the town would agree to maintain it. As completed in 1743, it was 150 feet long and forty feet wide, and was substantially built of bricks imported from England. In 1761 it was almost destroyed by fire, only the four walls remaining. It was at once rebuilt, considerably enlarged, and was dedicated to the cause of liberty in a fiery speech by James Otis.

Then followed the exciting times of the Revolutionary period. In Faneuil Hall the local Committee of Correspondence established its headquarters in 1772. There, on the night preceding the Battle of Bunker Hill, General Howe was watching the performance of a farce, *The Blockade of Boston*, presented by some



PAUL REVERE'S HOUSE

It stands to-day in an unattractive, unsightly part of the city.

of the English officers and their wives. The audience was being amused by a dialogue between a caricatured Washington, bearing a rusty sword, and his grotesque squire, when a messenger burst into the hall with the shout, "The Yankees are attacking our works on Bunker's Hill." Many in the audience were highly amused, thinking that the interruption was a part of the play. But they were undeceived by Howe's sharp command, "Officers, to your alarm posts," and amid shouts and screams, the performance came to an abrupt end. The site of the battle, in Charlestown, is marked by the famous Bunker Hill Monument.

After the colonies had won their independence, Faneuil Hall became the favorite meeting place for the discussion of public affairs. The hall could not be rented or sold, but was open to the public by permission of the aldermen. This semi-public character gave a peculiar authority to Faneuil Hall meetings, and in other parts of the country, the speeches and

resolutions at such meetings were considered to represent public opinion in Boston. There were held many blood-stirring assemblies at the height of the anti-slavery movement. There, in 1837, Wendell Phillips delivered his first great oration as a protest against the murder of Elijah Lovejoy, at Alton, Ill. Webster, Choate, Sumner, and Theodore Parker were a few of the others who made history within those four walls. Although much enlarged in 1805 and carefully restored in 1808, Faneuil Hall has long since been too small for great public meetings, and it is now a museum of colonial and Revolutionary days. The lower floor is still used as a market.

Old South Meeting House. "Old South," as it is familiarly and affectionately known, is intimately connected with the stirring times before the Revolutionary War. The present structure was built in 1730 to replace an older church which had stood on the same site since 1660. During the pre-Revolutionary agitation, meetings were held there and addresses were delivered which won for it the title of the "Sanctuary of Freedom." There was held the great public meeting which preceded the Boston Tea Party (which see). During the siege of Boston, it was despoiled of its library and was turned into a riding school for the British soldiers, and for a short time after the great fire of 1872, it was used as a postoffice, but it now serves as an historical museum. It is located at Washington and Milk streets.

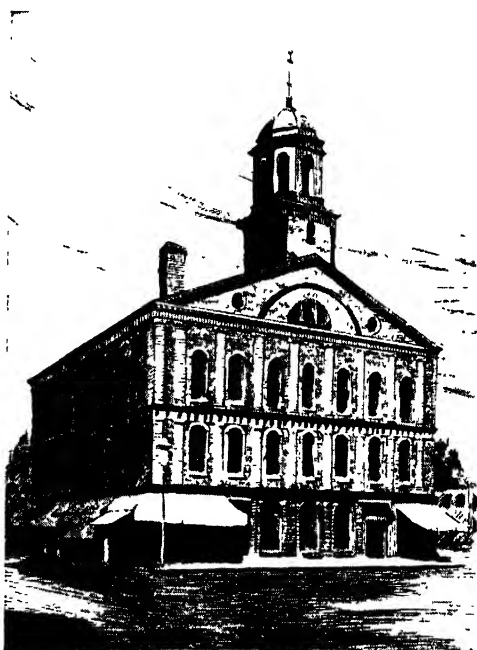
Other Historic Features. The oldest church in the city is Christ Church, built in 1723 on Salem Street, at the foot of Hull, in North End; it is the "Old North Church" from which were hung the signal lanterns for Paul Revere. Revere's house, in the North End, is still standing (see REVERE, PAUL, and accompanying illustration). King's Chapel, on Tremont and School streets, was built in 1754 on the site of the first Episcopal church in Boston. The adjoining burial ground is the oldest in the city, in it is the grave of Governor Winthrop. Old Granary Burying Ground, on Tremont, between Beacon and Park, dating from 1660, has the graves of Samuel Adams, James Otis, Peter Faneuil, the Hancock family, and Paul Revere. In Copp's Hill Burying Ground, also dating from 1660, are the graves of Increase and Cotton Mather.

The Old State House (1748), on Washington Street, has been restored to its original appearance, and has many interesting relics and paintings. Of it, Oliver Wendell Holmes said, in the *Autocrat of the Breakfast Table*: "Boston State House is the hub of the solar system. You couldn't pry that out of a Boston man if you had the tire of all creation straightened out for a crowbar."

Notable Modern Buildings. Some of the most interesting architecture of modern Boston is to be seen at Copley Square, a grass-covered triangle in the Back Bay district, at the intersection of Boylston and Dartmouth and Huntington avenues. Grouped about it are the public library, Trinity Church, New Old South Church, and the Copley Plaza Hotel. The library, completed in 1895, is a stately structure of gray granite, in the Italian Renaissance style. It is nearly square, and encloses an open court surrounded by an arcade. Over the main entrance are reliefs by Augustus Saint Gaudens, and the interior is richly decorated

with mural paintings by Puvis de Chavannes, John S. Sargent, and Edwin A. Abbey. Directly opposite the library is Trinity Church (Protestant Episcopal), generally regarded as the finest American example of the French Romanesque style. Its beautiful interior decorations and stained-glass windows are by William Morris, Burne-Jones, and La Farge.

Huntington Avenue, which extends from Copley Square to Brookline, is noted for its many fine buildings devoted to arts and educa-



FANEUIL HALL

As it appears to-day.

tion, these include Mechanics' Hall, the Opera House, Symphony Hall, the Conservatory of Music, Tufts Medical School, and the Museum of Fine Arts. On Huntington also is the Mother Christian Science Church (see illustration, under CHRISTIAN SCIENCE).

Until 1928 a height of 155 feet was the limit for tall buildings; with step-backs, a greater height is now possible. There are a number of conspicuous structures devoted to government purposes. The best known of these is the statehouse, on Beacon Hill, begun in 1705 and completed in 1798, after designs by Charles Bulfinch (1763-1844), later the architect of the Capitol at Washington. The building was greatly enlarged in 1890, the extension maintaining the colonial style of the original part. The customhouse, on State Street, was erected in 1837-1848. It was originally a low building with a large central dome, but was transformed in 1915 by the addition of a lofty central



Photos Keystone

Notable Views in Boston. The historic statehouse Boston Common under a cover of snow

tower over the dome; the building now has the greatest height of any in New England, as the Federal government is not subject to municipal restrictions. Not far distant is the site of the Federal building; a new structure is now being built.

Educational and Other Institutions. Boston's reputation as one of the foremost centers of American culture has been long maintained. Its public library has over 1,284,000 bound volumes, including one of the greatest existing Shakespeare collections and the best collection on music, according to report, in America. No other free public library in the world has as large a circulation of books. Other famous libraries in Boston include that of the Boston Athenaeum (300,000 volumes) and the Boston Medical Library (130,000 volumes). It is estimated that within a radius of fifteen miles from the State House there are 5,000,000 volumes available for public use.

The secondary schools of the public-school system are particularly excellent; the Boston Latin School, founded in 1635, is the oldest high school in America. Among higher institutions of learning are Boston University (Methodist Episcopal), Boston College (now in Newton), Simmons College (for women), College of Physicians and Surgeons, and the Massachusetts College of Pharmacy. Massachusetts Institute of Technology, known the world over as "Boston Tech," has since 1916 been located in a magnificent group of buildings on the Cambridge side of the Charles River. The medical school of Tufts College and the medical and dental schools of Harvard University are also in Boston.

The New England Conservatory of Music, with an enrollment of about 3,000, is widely known throughout the country. Boston has a Symphony Orchestra of highest reputation, and maintains also a permanent grand-opera organization and the Handel and Haydn, the Cecilia, and the Apollo musical societies. Its Art Museum, which is famous for its Japanese pottery and paintings and other Oriental collections, conducts a school for art students. Mention should be made, too, of the Perkins Institution for the Blind. Though removed from South Boston to Watertown in 1913, it will always be associated with Boston and with one of Boston's honored sons—Dr. Samuel G. Howe, whose wife, Julia Ward Howe, was the author of *The Battle Hymn of the Republic*.

Local Transportation. Four electric-railway systems operate in the Metropolitan Area. A consolidation of surface, elevated, and subway lines, the Boston Elevated Railway System, gives the city and outlying towns rapid transportation over about 540 miles of track, a universal transfer system eliminating the payment of double fares. Sections not reached by this system are served by three interurban

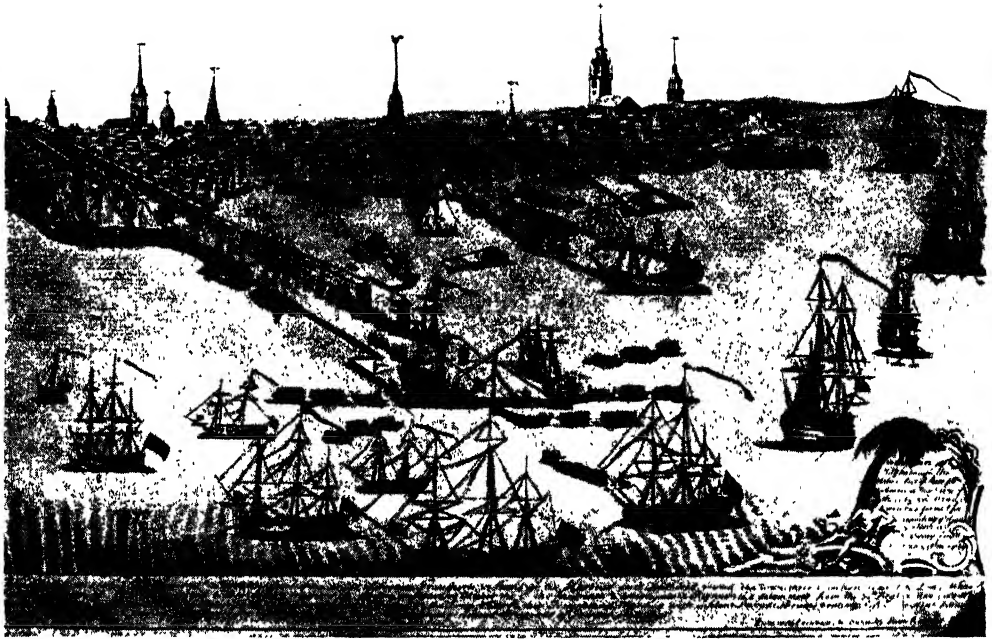
railways—the Bay State, or Eastern Massachusetts, the Boston & Worcester, and the Middlesex & Boston.

At Jeffries Point, East Boston, a municipal airport is maintained for commercial mail and army planes and for those privately owned. This landing field has the especial advantage of being less than two miles from the business center, and of being nearer Europe than any other airport operated by a large city.

Railroad Transportation. Boston is the leading industrial and distributing center of New England, and has ample facilities for handling freight and passengers destined for any other parts of the United States or Canada. The city is the terminus of the Boston & Maine, the Boston & Albany, and the New York, New Haven & Hartford systems, and is also served by the narrow-gauge Boston, Revere Beach & Lynn Railway. The Boston & Maine uses the North Station, on Causeway Street and the Charles. This station, which was rebuilt in 1928, has a capacity of 25,000,000 passengers a year. The South Station, used by the other two roads, is on the opposite side of the business section, and has a frontage on Fort Point Channel. It covers thirteen acres, and when opened in 1899 was the largest railway terminal in the world. It accommodates 645 trains a day.

The Port. Boston has one of the finest and safest natural harbors on the Atlantic coast. It has an area of 30,000 acres and a water front of 141 miles, of which forty miles are available as berthing space. Along an eight-mile front, the water depth is never less than thirty feet. The port is 200 miles nearer the European coast than New York, is closer to the Panama Canal than is San Francisco, and is nearer Rio de Janeiro and Buenos Aires than is Baltimore.

Since 1840, when Boston was chosen as the American terminus of the Cunard Line, it has had direct steamship lines to Europe, and in recent years has greatly extended its range of shipping connections to other parts of the world. In 1911 the Massachusetts state legislature appropriated \$25,000,000 for the improvement of the port of Boston. The great Commonwealth Pier, in South Boston, 1,200 feet long and 400 feet wide, was completed in 1913 at a cost of \$4,500,000. During the World War an army supply base, with unsurpassed pier equipment, was built in South Boston, and is now available for commercial use. Also in South Boston is one of the largest dry docks in the world, capable of accommodating vessels the size of the *Leviathan*. The wharf facilities of the overseas and coastwise shipping lines and the port terminal structures of the three railroads fringe the harbor for miles. While New York, Philadelphia, and Baltimore, among the Atlantic ports, have a higher total of water-borne commerce than Boston, that city is second only to New York



BOSTON TOWN IN THE YEAR 1768

The imprint in the lower corner declares the picture to have been "Engraved, Printed, and Sold by Paul Revere." The descriptive words at the bottom of the picture are as follows:

"On Fryday, Sept. 30th, 1768, the Ships of War, armed Schooners, Transports, &c., Came up the Harbour and Anchored round the Town; Their Cannon, loaded, a Spring on their Cables, as for a regular Siege. At noon on Saturday, October the 1st, the fourteenth & twenty-ninth Regiments, a detachment from the 50th Regt & Train of Artillery, with two pieces of Cannon, landed on the Long Wharf; then Formed & Marched with insolent Parade, Drums beating, Fifes playing, and Colours flying, up King Street, Each Soldier having received 16 rounds of Powder and Ball."

in quantity of imports. The harbor entrance is guarded by the famous Minot's Ledge Lighthouse.

Financial and Industrial Development. Boston is one of the leading financial centers of the country, ranking next to New York, Chicago, and Philadelphia in bank clearings. The Federal Reserve Bank of Boston is headquarters for the First Federal Reserve District. The location of the city in the heart of a prosperous, densely populated section, and its convenient position as a terminal for waterborne and railroad freight, have greatly stimulated manufacturing. In Metropolitan Boston there are over 5,000 industrial establishments, representing an invested capital of over \$894,000,000. The leading industries are the manufacture of boots and shoes, cut stock and findings, printing and publishing, slaughtering and meat packing, and the production of rubber goods, woolen and cotton garments, electrical apparatus, ice cream and confectionery, bread and other bakery products, foundry and machine-shop products, and leather goods.

The city and surrounding towns constitute the largest shoe-manufacturing center in the

world, and the leading American center for cotton manufacture. Boston is the first wool market of the United States, ranking next to London, and is second only to Grimsby, England, as a fish port. The city is also a progressive retail center. Measured by equipment, service, and quality of stock, its department stores are among the best in America.

History. Before the Revolutionary War, the history of Boston was largely that of Massachusetts, and after the Union was formed, the important events in its story were nearly all connected with national movements.

The first man to enter Boston Harbor was Captain John Smith, who came in 1614. In 1630 John Winthrop's colony settled at Charlestown, across the river, but before the end of the summer decided to move to the peninsula then known as Trimountaine, from its three hills. This name is more familiar in its modern form, Tremont. On September 17, 1630, it was officially ordered that the settlement should be called Boston, after the city of that name in England, from which some of the leading colonists had come. In 1632 Boston was chosen as the capital of the colony. During the seven-

QUESTIONS ON BOSTON

(An Outline suitable for Boston will be found with the article "City.")

Questions

What was Boston originally called, and why? What street in the city recalls the old name?

Why has Boston had no great "skyscrapers" such as are found in other great cities?

If an early settler could return now, what would he find different about the site of the city?

What drawbacks have the streets in the "downtown" section? How do you account for this?

Under what circumstances was the announcement of an epoch-making event taken for part of a play?

What building is known as the "Cradle of Liberty" and why?

How would it affect the literature of the United States if Boston and its literary history were blotted out?

What building is intimately associated with one of the best known of American poems?

How did the opening-up of the West affect the industrial life of Boston?

What great religious organization has its home in Boston?

How does Boston compare in area with the following: New York, Chicago, Philadelphia, Los Angeles, and Baltimore?

What Boston suburbs are famous for containing the following: the oldest university in America, a factory making high-grade watches; the graves of Longfellow and Lowell?

Describe the geography of Boston when Paul Revere "spread the alarm through every Middlesex village and farm."

Why do the largest steamships go to the port of Boston for repairs?

Why does a visitor to Boston usually want to go to Charlestown?

Where and when did the Boston city fathers set aside a park for training and the feeding of cattle? How is the area used now?

Name the three oldest burying grounds in Boston, and tell why they are memorials of the city's early history.

What can you tell about the sculptor who made the Shaw Memorial?

Why is the Public Garden a delightful place in the spring and summer?

How is the park system of Boston and its suburbs laid out?

What is the Arnold Arboretum?

Describe the architecture of the buildings at Copley Square.

What is there especially interesting about Huntington Avenue?

On how many levels can you ride, using Boston's city railway system and paying but one fare?

What advantage over other Atlantic ports has Boston Harbor?

What is the rank of the Boston district in the manufacture of boots and shoes, and as a wool and fish market?

With what epoch-making events of the War of Independence is Boston associated?

Of what Boston journalist was it written:

In a small chamber, friendless and unseen,
Toiled o'er his types one poor unlearned young man

Why is Boston known as "The Hub"?

What building rises higher than the limit established by the state legislature?

Name six famous men whose home was in Boston.

In how many ways was Paul Revere notable?

teenth and eighteenth centuries, the town prospered, and at the beginning of the War of Independence, with a population of 20,000, it was the most important town in the colonies. The Stamp Act, the Intolerable Acts, the Boston Massacre, the Boston Tea Party, and Boston's part in the Revolutionary War are discussed elsewhere. See **REVOLUTIONARY WAR IN AMERICA**, with topics indexed therewith.

After the Revolution, the city enjoyed a steady growth in size and prosperity. In 1822 it was incorporated as a city, and is to-day governed by the charter then adopted. Though slave-holding was permitted in Boston in its earlier history, it became the center of the emancipation movement, which was carried on under the leadership of William Lloyd Garrison, founder of the New England Anti-Slavery Society. During the decade before the outbreak of the War of Secession, feeling ran high in Boston, and the city sent over 26,000 men to the support of the Union cause.

In 1872 a destructive fire wiped out sixty acres of business property, but the era of reconstruction that followed left Boston a finer city than it had ever been. The construction and subsequent enlargement of the subway system, the building of the dam across the mouth of the Charles, and other improvements mentioned in the preceding paragraphs of this article are typical of the spirit of enterprise and progress that has made Boston a city of many interests, cherishing the old, yet appreciative of the value of the new. See **MASSACHUSETTS**, and topics indexed therewith. K.P.L.

BOSTON COLLEGE. See **MASSACHUSETTS** (Education).

BOSTON MASSACRE, *mas' a kur*, a fight between a mob of Boston citizens and a squad of British soldiers, on March 5, 1770. It was one of the earliest and most serious disturbances of the critical period before the Revolutionary War.

The opposition of the colonists to the various acts of oppression on the part of Parliament and the king had led to the quartering of two regiments of soldiers upon the people of Boston, and this the latter resented as an unwarranted invasion of their rights as British subjects. A squad of soldiers, stationed on King, now State, Street, angered by the taunts and stone-throwing of a mob of men and boys, fired into the throng, killing three and wounding seven, two of whom died later. The officers and men responsible for the firing were tried for murder, but were acquitted on this charge, after being defended by John Adams and Josiah Quincy, who later were to become famous among American Revolutionists. Two soldiers who were found guilty of manslaughter were branded on the hand, and the entire garrison was removed to Castle Island, out in the harbor. The colonists regarded the affair as a triumph for their

principles. A monument in memory of the victims of the Boston Massacre was erected in Boston in 1888. See **REVOLUTIONARY WAR IN AMERICA**.

BOSTON MOUNTAINS. See **ARKANSAS** (The Land).

BOSTON PORT BILL, a bill passed by the Parliament of England and signed by King George III, on March 31, 1774. It was inspired by the wholesale destruction of tea in Boston Harbor on December 16, 1773 (see **BOSTON TEA PARTY**). This bill was to go into effect on June 1, 1774, and was virtually to close the port of Boston to trade. Salem was to be the seat of government, and Marblehead the port of entry, until such time as the people of Boston should pay for the property destroyed and meet other imposed conditions. Such an attack upon the liberties of the colonists aroused a deep feeling of indignation, and the people were given strong assurances of support by the legislatures of other colonies. The Boston Port Bill was one of five laws passed by Parliament to punish the people of Massachusetts for their defiant attitude (see **INTOLERABLE ACTS, FIVE**). As these acts aroused the colonists to further resistance, they helped to bring on the Revolutionary War. See **UNITED STATES** (History: Causes of the Revolution).

BOSTON TEA PARTY, in American history, the name applied to a famous raid on a number of English tea ships anchored in Boston Harbor.



Photo: Visual Education Service

BOSTON TEA PARTY

As an artist whose identity is not known viewed the historic incident

This occurred on the night of December 16, 1773, when American indignation over the tax imposed on imports of teas was at its height. When ships laden with tea, sent to America by the English East India Company, arrived at Boston, the people assembled in a town meeting

and passed resolutions urging the English Governor Hutchinson to demand the immediate return of the vessels. His message of refusal, conveyed to a mass meeting held in the Old South



Photo U & U

AN HISTORIC TABLET

A bronze plate imbedded in a granite boulder in Lincoln Park, Chicago, bears this inscription. "In memory of David Kennison, the last survivor of the Boston Tea Party, who died in Chicago, February 24, 1852, aged 115 years, 3 months, 17 days, and is buried near this spot. This stone is erected by the Sons of the Revolution, the Sons of the American Revolution, the Daughters of the American Revolution."

Meeting House, was followed immediately by the famous "Tea Party." A band of citizens disguised as Indians and armed with hatchets hurried to the wharf, boarded one of the vessels and broke open 342 chests of tea, throwing their contents into the harbor. In this forceful and picturesque fashion, the citizens of Boston announced their conviction that "Taxation without representation is tyranny." See REVOLUTIONARY WAR IN AMERICA; UNITED STATES (History: Causes of the Revolution).

BOSTON UNIVERSITY, established in Boston, Mass., in 1860, by the Methodist Episcopal Church, and open to both men and women. It includes college and graduate departments, schools of theology, law, medicine, and science; and it provides post-graduate work in science, language, history, and philosophy. The agriculture college is allied with the Massachusetts Agricultural College at Amherst.

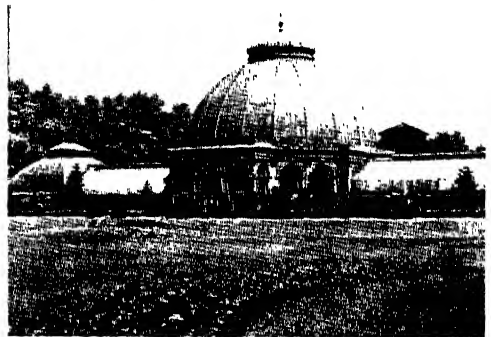
BOSWELL, *boz' wel*, JAMES (1740-1795), a Scottish writer whose masterpiece, *The Life of Samuel Johnson*, is one of the greatest biographies in English literature. Born at Edinburgh, he was educated there and in Glasgow, and at the University of Utrecht. The most important event in his life was his introduction in 1763 to Johnson, whose writings he ardently admired. The acquaintance ripened into a friendship that shaped Boswell's whole career. He was admitted in 1773 to the Literary Club founded by Johnson, which included among its members Burke, Goldsmith, Sir Joshua Reynolds, and David Garrick. From that time on, Boswell made careful notes of all that his idol said and did.

The two made a famous visit to Scotland and the Hebrides in 1773; Boswell published a description of their travels in 1785, under the name *Journal of a Tour to the Hebrides*. In 1791, seven years after Johnson's death, the great *Life* appeared. This masterly work, with its wealth of detail and vivid portrayal of Johnson's personality, is ranked by Macaulay as the first among biographies. See JOHNSON, SAMUEL.

BOSWORTH FIELD. See HENRY (VII. England).

BOTANICAL, *bo tan' i kal*, **GARDEN**, a garden in which plants are cultivated, primarily for scientific, educational, and artistic purposes. Until modern times their sole aim was the cultivation of plants for the needs of medical science. Modern botanical gardens are usually connected with universities or are situated in parks under local government control, and are like museums in so far as they aim to show the principal types of plant life of the earth. In parks, the garden feature is generally associated with greenhouses, or conservatories. See CONSERVATORY.

In the United States, there are many fine collections of plants, but only a few bear the



BOTANICAL GARDEN, OR CONSERVATORY

name of botanical garden. The New York Botanical Garden, occupying 250 acres in Bronx Park, New York City, has the finest greenhouses on the continent. The Missouri Botanical Garden of Saint Louis is the legacy of an individual, Mr. Henry Shaw; the Brooklyn Botanic Garden has developed special features for teachers; the botanical garden of Cambridge, Mass., and the Arnold Arboretum at Brookline, both in connection with Harvard University, are well known. In Canada, the principal botanical garden is at McGill University, Montreal.

Of the numerous ones in France, the Jardin des Plantes, in Paris, is the most noteworthy. It is one of the oldest and largest in the world, growing over 15,000 species of plants. The Royal Gardens at Kew, near London, are world-famed, as are also those at Edinburgh, Oxford, and Dublin.

B M.D.



BOTANY. Directly or indirectly, man and all the lower animals are dependent upon the plant world for food, for shelter, and for clothing (see PLANT). Intelligent persons, therefore, cannot fail to take some interest in plants, in crops, and in vegetation. Intelligent interest leads to observation of plants, and there the study of plant life begins. This is informal, but it may lead, and often does lead, to the desire to have formal, systematized information, which makes up the science of botany. This science deals with plants in their many aspects—the description of them, their relationships, their habits, their life processes, their distribution, and their uses.

"Where's the second boy?" asked Mr. Squeers.

"Please, sir, he's weeding the garden," replied a small voice.

"To be sure," said Squeers, by no means disconcerted. "So, he is B-o-t, bot, t-i-n, tin, bottin, n-e-y, ney, bottinney, noun substantive, a knowledge of plants. When he has learned that bottinney means a knowledge of plants, he goes and knows 'em. That's our system, Nickleby."

So spoke the schoolmaster in Dickens' *Nickleby*, defining the word *botany* better than he spelled it. Though his working out of the method was absurd in the extreme, he described it correctly enough, for the only way of mastering the science of plants is simply to "go and know 'em" by actual experience, in the laboratory and in the field.

It is rather the fashion of many who have never made any systematic study of botany to affect to despise it—to declare, "I love plants, but I hate botany." This is like saying, "I love music, but I want to know nothing about it." The true plant lover will want to know as much as possible about the plants in which he is really interested; and while there are occasional botanists who, as Emerson says,

Love not the flower they pluck and know it not,
And all their botany is Latin names,

such persons are primarily interested in their technique of classification and of producing a finished museum specimen.

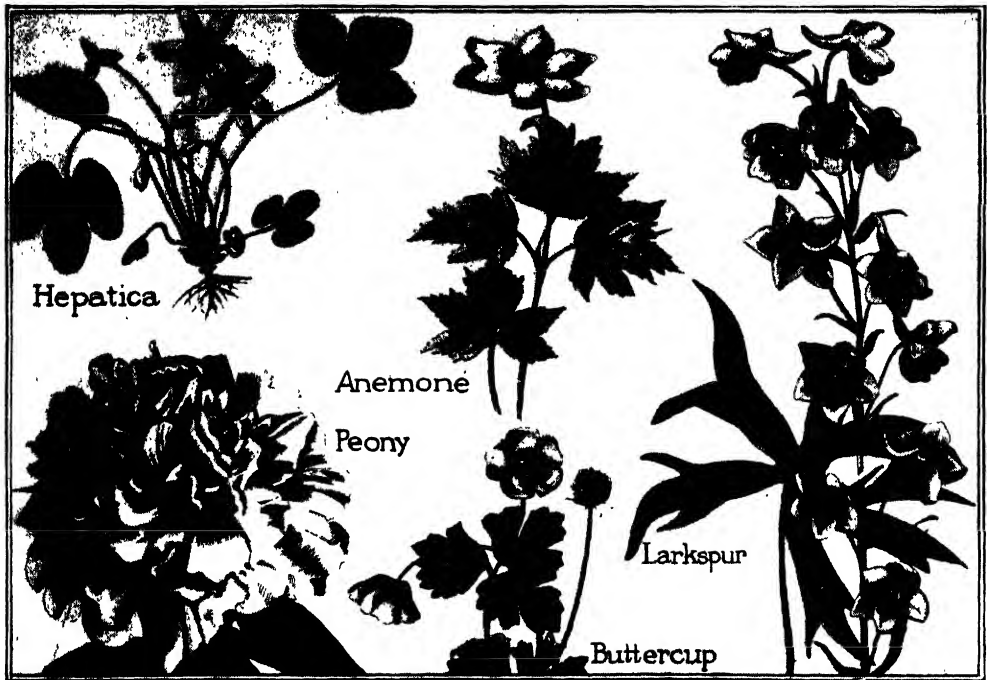
Story of the Growth of Botany. With some sciences, it is difficult to imagine just how they began, but this is not the case with botany. All about, wherever men lived, there plants lived too, and so conspicuous were many of them that they naturally attracted attention. In the earliest ages, doubtless, this

attention was somewhat casual—man had done nothing to bring the plants there, and he troubled himself not at all about their growth or development. If they bore berries or fruits which might be eaten, he ate them, and probably, until distinctions were established, many persons died from eating poisonous fruits.

As men advanced and came to have a little leisure for other things besides gaining a bare living and fighting off their enemies, they began to take more interest in the things about them, and the plants, apparently useful for many things, drew their attention. There were numerous curious differences in these plants which challenged investigation. Some were always green; some spent the winter with bare, dead-looking branches, but came to beautiful life in the spring; some really died, and never became green again with the coming of warm weather, but new plants of the same kind appeared each season.

Some bore wonderful flowers, but were good for nothing save to look at, while others, with no flowers to attract attention, had luscious fruits, rich nuts, leaf buds that served as food, or roots that might be made into bread. Gradually, besides the knowledge of their food value, there came to the minds of men one most important fact—that in certain plants there were qualities which made them good for various sicknesses. And it was in the study of these medicinal plants that botany really began, physicians being the first botanists. Writers in ancient Greece and Rome occasionally produced works on plants, but these dealt almost entirely with such as could be used as medicines or for crop purposes.

These students of plant life, who called their slowly growing science *botany*, from a Greek word meaning *plant*, had little thought of a systematic classification of plants, nor could they, with their limited knowledge, have attempted anything like what has become modern classification. The Middle Ages saw no advancement in this plant science, but when, about the sixteenth century, there was a new interest in learning of all sorts, botany came in for its share. Some of the earliest illustrated books were about plants, and many of the old woodcuts used would be, in point of beauty, a credit to modern books. Still the chief interest was in the illustration and description of disease-healing plants, and only gradually



SOME MEMBERS OF THE BUTTERCUP FAMILY

did the more general phases of the subject make their appeal. Attempts at classification were made, until, with Linnaeus, in the eighteenth century, the period of wavering and uncertainty came to an end. First of all, the importance of floral anatomy as a basis of classification was recognized; and secondly, Linnaeus introduced the *binomial system* of nomenclature. In fact, from the time of that great naturalist, who is looked upon as the founder of modern botany, classification has grown constantly more elaborate and more exact (see LINNAEUS).

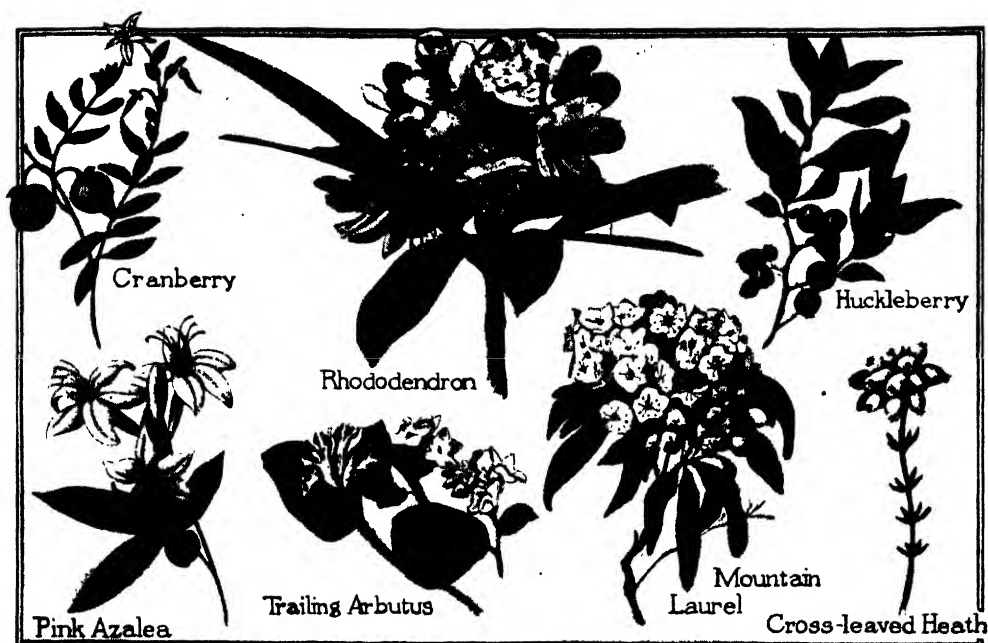
Botany of Schools. To-day, botany has a regular place among the sciences studied, but under its technical name is to be found only in high schools and colleges, for classification, the comparative study of plant structure, and the systematic study of plant development are too difficult for young children. But these do not make up the whole of botany, and children are by no means cut off from the enjoyment of this subject, which seems of all the sciences to be the one designed to appeal to them. Interest is aroused and observation is quickened when by experience with the thing itself the child learns to identify a buttercup, to tell a petunia from a morning-glory, or to distinguish poison ivy, that he may avoid it in the woods; and few are the schools which do not include some study of plant life. In the lower grades this is called nature study,

but it is the real beginning of botany (see NATURE STUDY).

Of Interest to Boys and Girls. Very many things which come under the head of botany are so curious and interesting that no child who approaches them correctly can fail to find in them as much pleasure as in a story. For instance, there is the marvelous way in which each plant draws from the soil primarily those elements needed to make it what it is.

A story every child loves is that old *Arabian Nights* tale of the gigantic genie which came out of the jar, causing the man who watched the process to wonder and to doubt the evidence of his senses that anything so huge could emerge from anything so small. But all over the land, in every garden, a more wonderful thing happens hundreds of times every year. One of the tiniest of all seeds is the poppy seed—it seems little more than a grain of dust. But when it is planted in the ground, it absorbs water and appropriates that right kind of food, until presently there stands in the garden above the spot where it was placed one of the most beautiful of all plants—dusty-looking, gray-green leaves, straight, slender flower stems, and crowning all, the gorgeous blossoms with their crinkled satin petals—all of which must have been present in the tiny seed.

Close beside the poppy, perhaps, if the garden be not very well kept, there grows by contrast



SOME MEMBERS OF THE HEATH FAMILY

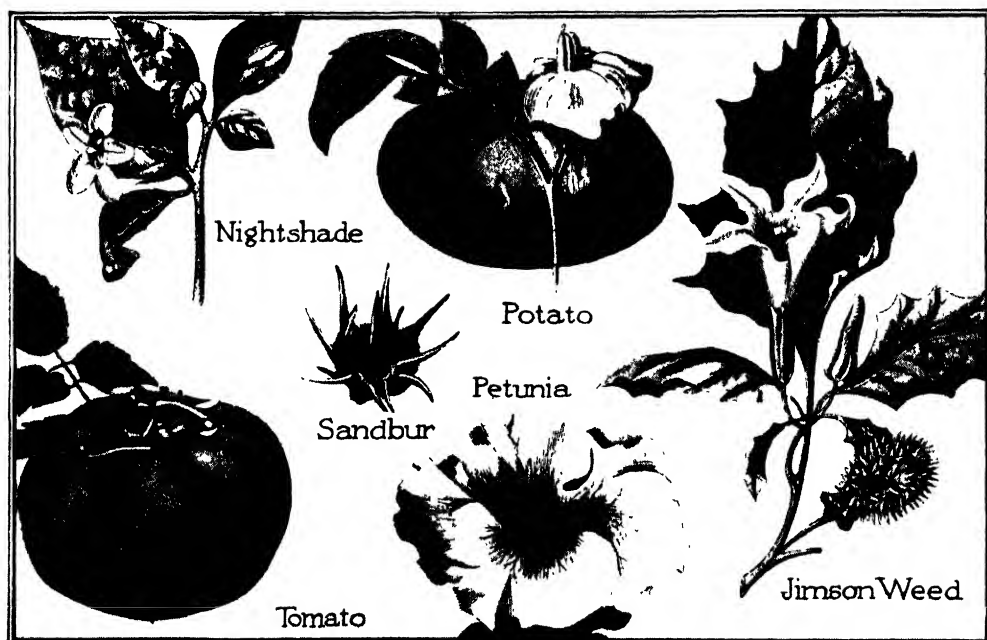
a cocklebur. Nobody planted it or knows how it came there—perhaps the dog brought home the burry seeds in his coat and shook them off; everyone calls the plant a nuisance, and wishes that it were out of the way. It is in the wrong place—a weed. But the wonderful thing is the differing heredities—that these two, the poppy and the weed, can grow there within a few inches of each other, in exactly the same soil, and while the poppy takes water and food and turns them into soft green leaves and delicate flame-colored flowers, the cocklebur takes up water and food and makes them into harsh, rough leaves and troublesome burrs. It is one of the strange and fascinating problems of heredity and development, the mechanism of which scientists are only beginning to understand.

Plant Families. Very curious are the family relationships which exist among the plants. In the animal world, the cat, the tiger, the lion, and the panther all belong to the same family, but that does not seem strange, for they all look very much alike. A child, seeing a tiger for the first time, will naturally call it "a great, big kitty." No one is surprised to learn that the dog and the wolf are of one family, for some kinds of dogs look enough like wolves to be cousins, if not brothers. In the plant world, too, there are some relationships that cause no surprise—that the blackberry and the raspberry should be close connections, for instance, is perfectly natural. But in some of the families there are members which super-

ficially do not look in the least like each other, and only a botanist might see at once the deeper seated resemblances. This grouping into families, indeed, is one of the most difficult and skill-requiring tasks of the botanist, and no child can hope to master all at once the technical classifications and the hard-sounding Latin names—the *Liliaceae*, the *Amaryllidaceae*, and so on. But the facts about many of the best-known families are simple enough.

The Lily Family. There is the lily family, for instance. The name calls up at once the Easter lily, the day lily, the lily of the valley, the Chinese lily, and many other beautiful flowers; but it does not suggest the tulips and the hyacinths, the dog-tooth violets, and the trilliums, all of which are just as truly members of the lily family. Two other members are thought of as vegetables rather than as flowers; these are the onion, with its unpleasant scent, so different from that of a true lily, and the asparagus, which does not look like a lily in any way, but has resemblances that are apparent to a botanist. See illustration, in article LILY.

The Rose Family. There is also the interesting rose family. "O yes," exclaims the child who is fortunate enough to have a garden, "that's a big family. There's the Cherokee rose, and the yellow rose, and the moss rose, and the tea rose, and the American Beauty, and ever so many more." But that is not the end, and that same child would be surprised to learn that, if the entire rose family were to



SOME MEMBERS OF THE NIGHTSHADE FAMILY

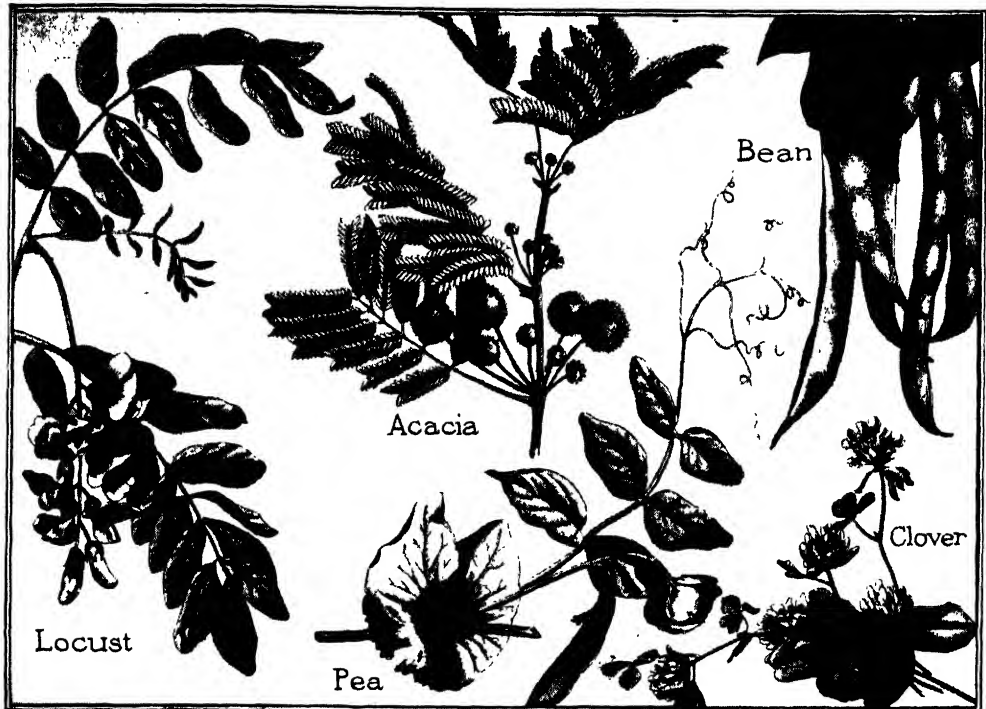
be destroyed, he would miss not only those beautiful ornaments of the garden and the florist's window, but the apples, pears, peaches, cherries, blackberries, raspberries, strawberries, plums, quinces, and almonds, as well as the sweet brier and the bridal wreath. In this great family, one of the most useful in the plant world, there are resemblances which a child can easily distinguish. The blossoms of most of the fruits mentioned above are found to be much like wild roses, after all, and the wild rose is the one true "natural" rose; all the other beautiful varieties have been produced from it. See illustration, in article ROSE.

Other Families. Another family which betrays its relationships to the careful observer is the pulse family, to which belong the peas and beans, the clover, the locust, alfalfa, and the acacia. If a red-clover blossom is examined closely, it will be seen that each of the tiny flowerets of which it is composed looks very much like a sweet pea, or like one of the flowers of the scented locust cluster. But suppose a big red peony, a bluish-purple larkspur, a pink hepatica, a white anemone, and a yellow buttercup be grouped together—would the layman ever dream that they were near relatives? And yet such is the fact, and the buttercup has given its name to the family. The poppy family includes the bleeding heart, the Dutchman's breeches, the bloodroot, and all the various kinds and colors of poppies; and the heath family is made up of the cranberry, the huckleberry, the exquisite trailing arbutus, and the

rhododendron; but perhaps the strangest of all families is one which includes some of the most useful vegetables, a widely grown, much-loved flower, several troublesome weeds, and a poisonous plant which should be carefully shunned. This is the nightshade family, of which the potato, the tomato, the petunia, the sandbur, the jimson weed, and the deadly nightshade are members.

Systematic and morphological botany furnish the explanations of these relationships. Naturally, it is difficult to point these out in simple language.

Why Plants Need Insects. A very interesting phase in the study of plant life concerns their interrelation with insects. Many insects are pests of the worst kind, and they inflict immeasurable harm upon plants; but there are some without which a great many plants could not fulfill their life history satisfactorily. In order to bear fruit and produce seed—the final purpose of every plant, useful or troublesome alike, that springs from the ground—a plant must have its blossoms *pollinated* as a preliminary to *fertilization*. That is, the dusty, yellow or brown pollen must reach the stigma, where it germinates and grows down into the seed case. The whole process may take place within a single flower, but cross-pollination is the general rule (see CROSS-POLLINATION). For transferring this pollen, plants are dependent upon the wind or upon insects, and wonderful indeed are the attractions which the flowers have developed in adjusting themselves to



SOME MEMBERS OF THE PULSE FAMILY

this relationship. The bright colors, the curious shapes, the sweet scents—above all, the delicious nectar or honey—are all but lures for the roving insects, and some blossoms have special features which make entrance impossible for any insect not fulfilling these structural requirements (see BEE).

Boys and girls may make many general observations of the aspects of cross-pollination. For instance, they may watch a patch of red and white clover, and discover what insects visit it. How many blossoms can a honey-seeking insect visit in five minutes? Does an insect visit first one flower and then another of an entirely different kind—first a clover, then a nasturtium in a near-by garden—or does it take only flowers of one kind?

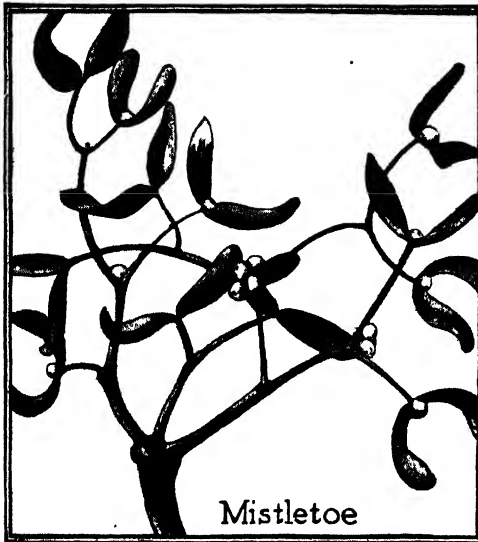
Unusually Interesting and Curious Plants. Plants are very much "alive," but unlike animals, they cannot move about, and they have no "intelligence" to help adapt themselves to circumstances. Yet some of them are especially equipped to procure food. There are the insect-eating plants, for instance, with various structures for catching and holding insects until the digestible parts have been absorbed (see CARNIVOROUS PLANTS); they are quite as adept at catching their insect food as is the whip-poor-will, which flies through the air with its mouth open, simply swallowing all that fly into its mouth. Then there are the

uninvited guests, or parasites, plants which cannot do the work necessary to the preparation of food, but fasten themselves upon some other hard-working plant and draw their nourishment from it until in the majority of cases, the host dies (see PARASITE).

To a botanist, a weed may be a far more interesting plant than the most carefully nurtured flower. It may show interesting physical characteristics, or habits. For it is no weakling—it does not demand care and congenial surroundings; it grows wherever it finds itself. And if, at times, it is too self-assertive, and after its fashion steals food, moisture, and air from weaker plants about it, why, that is what makes it a weed. The name *weed* is but a relative term, and almost any plant might be so called under certain conditions. See WEEDS.

Another very interesting class of plants consists of those that possess or establish a reserve food supply. Such reserves imply an adjustment to future requirements. Naturally, this food-reserve habit has been seized upon by man, and through selection it has been greatly developed. It is this food-storage organ in the beet, the onion, the carrot, the parsnip, or the turnip which man eats.

These are *biennial*, or *two-year*, plants—that is, they do not produce seed the first year they are in the ground. During the first summer, they are busy manufacturing food and



Mistletoe

THREE FAMILIAR EXAMPLES OF PARASITES

1-Mushroom
2-Dodder

laying it away, either in their roots, as in the case of the turnip or carrot, or in that part of the stem known as the bulb, as in the case of the onion. The second year this stored food is used in building the shoot, on the top of which the flowers and finally the seeds appear.

Everything in those plants which have blossoms works toward that one end—the production of seed; but after these have ripened, something remains to be done; there are adjustments all along the line. How are the seeds to be carried to some place where they may take root and grow? So interesting and important is this question that an entire article has been devoted to it in these volumes, and in the article SEEDS, under the subtitle *Seed Dispersal*, will be found descriptions of the devices by means of which seeds are transported.

The Struggle for Existence. There are many, many people who go through life and never see a foxglove; it is not one of the very common flowers. And yet a knowledge of the seed-producing ability of that plant makes it seem strange that there are not foxgloves to be pushed aside wherever one steps. For a single foxglove plant may bear in a year over 1,250,000 seeds, and if every one of these were planted, and if each grew and bore seeds, there would be at the end of the second season 1,562,500,000,000 seeds. Continuing the process, it may be seen that the descendants of the one foxglove plant would within a comparatively few years spread all over the earth; the same might be said of many other species.

But all of this hinges on a very large *if—if* every seed could be planted, grow, and produce seeds. It is here that the “struggle for exist-

ence” and the “survival of the fittest,” as the scientist Darwin expressed it, must be reckoned with. For plants as well as animals have to fight for a chance to live, and only the strongest and those best fitted for life under the conditions among which they find themselves manage to exist.

One of the things plants have to fight is overcrowding. So many little plants spring up close together that all cannot possibly find room to grow and food enough to make them strong. Every farmer knows this, and he is guided by the knowledge, for if he sows his seeds too thickly, the plants must be thinned out as soon as they show above the ground, else few of them will be as strong as they should be. Everyone has noticed how many tiny trees often spring up under the parent tree where the seeds have been dropped, but comparatively few of these, and those the strongest, ever grow up.

Changes in climate or moisture conditions are other enemies of plant growth. Certain plants need much moisture, and if for any reason the water in a locality grows less and less and finally is gone entirely, these moisture-loving plants must die; swamp vegetation is a definite type which is destroyed when a marsh or swamp is drained. On the other hand, land plants frequently suffer from flood conditions. In the late spring, untimely frosts kill off millions of little plants which are still too feeble to resist the cold, and the first frosts of autumn prevent many a plant from ripening its seed.

Animal enemies, too, are numerous, and include not only cattle, sheep, and other grazing

animals, but smaller and still more deadly foes—the locust, chinch bug, and other insects. Whole crops in various parts of a country are destroyed by these insects every year. See INSECT, and each pest named above, in their places in these volumes.

Through these and other agencies, it comes to pass that the earth is not a jungle like that of the Amazon—a jungle so dense that men and animals cannot find their way through. In the long run, though vegetation may be luxuriant one year and sparse the next, the

growth and the dying-out just about balance, so that if left to itself, vegetation remains fairly constant. Man, by his deliberate efforts, can do much to change this; he can cut down centuries-old forests and so cause all the surrounding region to suffer, or he can till and plant barren stretches until “the desert shall rejoice, and blossom as the rose.”

For a discussion of the structure of plants, the functions of their different parts, and the way they grow, see BUD; FLOWERS; LEAVES; SEEDS; STEM.

Organized Botany

The botanist or the serious, mature student finds in the science far more than a series of loosely connected, interesting facts about flowers and trees and weeds. His botany includes the study of every plant form that grows, from the tiniest bacteria, that can be seen only with the aid of a microscope, to the gigantic trees

is based; plant *anatomy*, the study of the tissues of which the plant is composed; *physiology*, which deals with the living plant as a whole, and with the functions of the various organs, leaf, stem, root, and the parts of the flower; and *ecology*, a somewhat recent and also interesting phase of the science. It deals with plants in relation to their surroundings, with vegetation—the changes due to changing environments and the special structures that adapt certain plants to conditions which others could not endure.

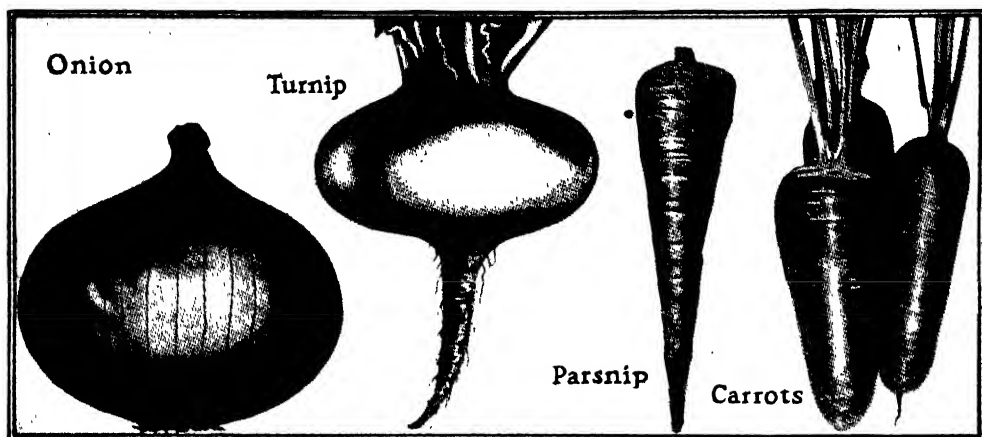
Botanical Terms. Anyone in North America who knows anything about trees knows an oak, but the trees which are called by this name differ in size, in manner of growth, in the shape of leaves and acorns, and in other particulars. Some are live oaks, others are white oaks, red oaks, or bur oaks, but all have an equal right to the name oak. In his scientific naming of plants, the botanist takes into account these variations, and calls each different kind a *species* (which see). That is, the live oak is a species, and the bur oak is a species; but all the oaks together constitute a larger group, called a *genus* (which see). The Latin name bestowed upon a plant consists of two parts, the first indicating the genus to which it belongs; the second, its particular species. *Quercus*, for instance, is the Latin word for oak, and is borne by all trees belonging to that genus, but *alba*, meaning *white*, is borne only by the white oak. The botanical name for the white oak, therefore, is *Quercus alba*.

But not all plants which are related are so closely connected as is one oak with another, and there must therefore be larger groups than the genus. The next higher is the *family*, which is composed of several or many similar genera (plural of *genus*). Above the family is the *order*, into which families that have certain resemblances are grouped, and still higher is the *class*. At the summit of the classification is the division into great groups, of which there are but four in the entire plant kingdom, and which are described below. Very definite differences in structure or in habit divide these groups from each other.



Is this a
flower
or a
weed?

whose “slender tops are close against the sky.” In fact, so wide is the study that it might be described as a group of sciences rather than as a single one. There is *morphology*, which deals with the development and mature form of plant structures, tracing the life history from the single cell to the final complex stage; *taxonomy*, or classification (see subhead below), which depends upon morphology for the facts upon which the arrangement of plants into groups



FOUR OF THE VALUABLE PLANTS THAT STORE FOOD

Classification. As botany has been a steadily growing science, it is natural that the classification should not have remained stationary; it therefore follows that to-day not all botanists use the same terms, or even the same divisions into groups. In the end, however, they all amount to exactly the same thing, and the classification here given is the one acceptable to most scientists. Some of the names are difficult, but in every case, explanations or alternative terms are given.

I. *Thallophytes* (*thal' o fites*), very simple plants without roots, stems, or leaves. Some are tiny, one-celled structures, others are large and showy; but none of them produces seed or flowers. To this lowest of plant groups belong the following forms:

(a) Bacteria are the simplest of plants. Most people who speak of these as microbes, germs, or bacilli do not realize that they are classed as plants as truly as is the greatest oak of the forest. (See BACTERIA AND BACTERIOLOGY.)

(b) Algae, or, as more commonly named, freshwater algae and seaweeds. These terms, however, are not sufficiently inclusive, since algae may grow on trees, in moist soil, or in similar situations. (See ALGAE.)

(c) Fungi, including such differing forms as bread mold, water mold, mushrooms, puffballs, and a host of filamentous fungi causing plant diseases or growing on dead materials. (See FUNGI.)

(d) Lichens, which partake of the character of both algae and fungi. (See LICHENS.)

II. *Bryophytes* (*bri' o fites*), or, to use a simpler name which means the same, "moss plants." This group includes two divisions:

- (a) Liverworts.
- (b) Mosses.

III. *Pteridophytes* (*tair' ih doh fites*), or "fern plants." Though the name means literally *fern plants*, other plants belong to the group, as listed below. Some of these pteridophytes

are large and beautiful plants, and to the untaught observer might seem to be as high in the scale as the grasses or garden plants, but they do not have flowers or produce seed.

(a) True ferns.

(b) Horsetails, or scouring rushes.

(c) Club mosses. The name must not lead to confusion with the true mosses lower in the scale.

IV. *Spermatophytes* (*spurm' a toh fites*). The name means literally *seed plants*, and it is of this group people usually are thinking when they talk of plants, for by all means the most conspicuous, beautiful, and useful members of the plant kingdom belong to it. Not all the seed plants of this great group belong to one class, the method of bearing the seed giving rise to a division into *gymnosperms* and *angiosperms* (see these titles in these volumes).

1. *Gymnosperms* (*jim' no spurmz*), or "naked-seed plants," which include—

- (a) Pines
- (b) Cycads.
- (c) Ginkgo, or maidenhair tree.

2. *Angiosperms* (*an' je o spurmz*), or plants with enclosed seeds, which include—

All of the common trees, except the pine, and all of the conspicuous garden plants.

They are divided into two groups, the divisions being based on the number of seed leaves. Those plants which have but one are classed as *monocotyledons*, those which have two, as *dicotyledons*, the term *cotyledon* here meaning *seed leaf*, and the *mono* and *di*, respectively, *one* and *two*.

(a). *Monocotyledons* (*mon o kot i le' donz*). To this order or subclass belong about forty plant families, some of which are of great importance. The chief of these are the following:

(1) Grass Family. This is probably the most useful to man of all plant families, for it includes not only the grasses, ordinarily so called, which are valuable for hay and for grazing, but the bamboo, the sugar cane, and all the cereals.

(2) Lily Family, which has about 2,600 species scattered all over the world. The section above on *Plant Families* gives an idea of the importance of this family.

(3) Palm Family. There are parts of the world where certain trees of this family are the mainstay of the people, and some of its members, as the coco palm and date palm, are of widespread importance.

(4) Amaryllis Family.

(5) Iris Family

(6) Orchis Family.

(7) Pineapple Family

(8) Banana Family.

(b) Dicotyledons (*dī kot ih le' donz*). To this subclass belong more than 200 families, some of them small and obscure, many of them very large and important, like the rose family. It is impossible to list all of these families here, but a glance at the few which follow will make plain to the general reader the great variety of dicotyledonous plants:

(1) Willow Family

(a) Poplar

(b) Willow

(2) Beech Family

(a) Beech

(b) Chestnut

(c) Oak

(3) Buttercup Family (see above)

(4) Poppy Family (see above)

(5) Mustard Family

(6) Rose Family (see above)

(7) Pulse Family (see above)

(8) Maple Family

(a) Maple

(b) Box-Elder

(9) Vine Family

(a) Grape

(b) Virginia creeper

(c) Boston ivy

Practical Aspects of Botany. See *The Contribution of Botany to Human Welfare*, which immediately follows. B.M.D.

The Contribution of Botany to Human Welfare

From a practical standpoint, our interest in the study of plants centers chiefly about the part that they play in food manufacture. Green plants, differing from all other plants and animals, are able to combine carbon dioxide and water into foods of the class known as carbohydrates. These include the sugars and starch, cellulose, glycogen, and others less familiar. With carbohydrates, plants combine certain mineral substances derived chiefly from the soil to form proteins—another class of foods indispensable to all organisms. Fats, a third major class of foods, are formed by plants directly or indirectly from carbohydrates. All foods, therefore, that are used by animals, including man, are either carbohydrates, or are produced from carbohydrates. Although we can transform foods in a variety of ways, even in some cases from one class to another, we are ultimately entirely dependent upon plants, since they alone manufacture carbohydrates and perform the initial steps in protein formation.

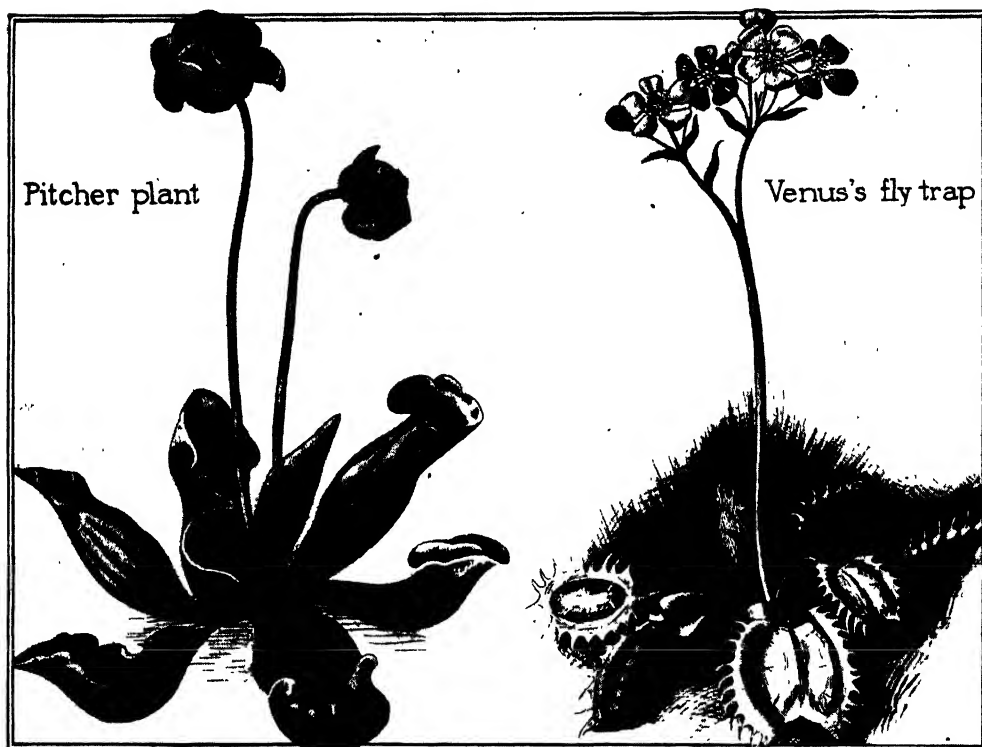
Photosynthesis (the process of carbohydrate manufacture) has a further significance to us in that it involves a storage of the energy of sunlight. Indeed, it is the energy stored in a carbohydrate, fat, or protein that renders that substance available as a food. But much of the energy derived by a green plant from the sunlight remains in a stored form in structures, such as wood, that persist after the plant is dead. Wood is useful as a fuel because when it is burned its stored energy is released as heat. All other fuels—including coal, petroleum, and natural gas, as well as such derivatives from plant substances as artificial gas and alcohol—are likewise stores of energy originally derived by green plants from sunlight.

The carbohydrates produced in photosynthesis are also the starting points in the manufacture by plants of many other useful

materials. Among these are a long list of substances used in medicine: fibers—for all important textile fibers except silk and wool are of plant origin, and even silk and wool are produced by animals from plant food;—lumber and other building materials; perfumes, essences, and the mysterious but indispensable substances called vitamins.

Photosynthesis being thus so fundamentally important, an understanding of it is essential to the continuance of human welfare. Toward its understanding, botanists and chemists have actively coöperated during the past quarter-century. The constitution of chlorophyll, the green pigment in plant cells which carries on photosynthesis, is now well known. Many of the steps in the photosynthetic process itself have been determined, although much remains to be learned. The conditions which permit and regulate photosynthesis are largely understood. The knowledge thus gained is being made available for the solution of problems that the race faces at once, or must face in the not distant future; such problems as that of an increased food supply, which will become of vital concern with the growth of the world's population; and that of a supply of fuel, since the coal and petroleum accumulated during millions of past years are being rapidly depleted.

Problems of the nature of those just mentioned are to be met in part by the introduction of new or improved races of crop plants. Most of the species of plants now widely cultivated were grown in Europe or Asia before the dawn of history. The chief exceptions are those species—including Indian corn, the potato, and tobacco—that were being cultivated in North and South America when Europeans first came to this continent. Since the years following the discovery of America, no plant of importance comparable with these has been brought



TWO OF THE CARNIVOROUS (INSECT-EATING) PLANTS

under cultivation by the white races. On the other hand, a considerable number of plants of lesser importance, including some used for fodder, a few vegetables, and some tropical fruits, have come into relatively wide use. There can be no doubt that the tropics still have much to offer in the way of useful, but as yet little-known, plants.

However, it is evident that we shall continue to depend in the main upon species of plants already in cultivation. The chief hope for an increased supply of the products that must always be obtained from plants rests, therefore, first, upon improved methods of cultivation, which depend in turn upon the fullest possible knowledge of the processes going on within the plants and of their responses to air and soil conditions surrounding them; second, and perhaps more largely, upon the production from older species of more vigorous and more productive strains.

The development of the latter field of research—that of plant breeding—is largely a matter of the present century. Until 1900, the production of new races of plants was empirical (founded upon experiment) and haphazard. But with the rediscovery in that year of Mendel's work, systematic plant-breeding became possible. The breeder now disposes of a great body of information regarding the laws

that govern the transmission of the characteristics of a plant to its offspring. It is possible to determine in advance, in great measure, which characteristics of a plant may, and which may not, be transmitted. The new knowledge is applied, first, in the selection of desirable strains already in existence; and second, in the production by hybridization of new strains. The plant breeder is also making use of information, partly available before 1900, but steadily added to in subsequent years, of the microscopic structures in the cells of plants which constitute the chief physical basis of inheritance (see HEREDITY).

By the comparative study of these structures (the chromosomes) as they occur in related species, it is possible to predict that certain species or varieties cannot be crossed with hope of recovering fertile progeny; whereas others, possessing similar chromosome groups, may be crossed with a fair probability of successful results. Certain experiments with wheat may be cited in this connection. During many years, crosses were made of two different species of wheat, in the hope of securing a new race that would combine the desirable characteristics of both parents. No useful results were attained. It is now clear that the two species in question differ in their chromosome numbers, and that successful crosses between them are

OUTLINE AND QUESTIONS ON BOTANY

Outline

I. Definition

- (1) Science of plants
- (2) A field and laboratory study—not a mere book study

II. What It Deals With

- (1) The composition of plants
- (2) Their structure
- (3) General life processes and functions of the plant members

III. Structure and Functions of Plant Members

- (1) Cells
- (2) Root
 - (a) Structure
 - (b) Functions
 - (c) Kind of root
 1. Fibrous
 2. Fleshy
 - (d) Storage of food in root
- (3) Stem
 - (a) Structure
 - (b) Functions
 - (c) Movement of water in stem
 - (d) Storage of food
- (4) Bud
 - (a) Structure
 - (b) Kinds of buds
 - (c) Position

(5) Leaf

- (a) Venation
- (b) Arrangement
- (c) Movements
- (d) Structure
 1. Chlorophyll
- (e) Functions

(6) Flower

- (a) Structure
 1. Calyx
 2. Corolla
 3. Stamens
 - a. Pollination
 4. Pistils
- (b) Functions

(7) Fruit

- (a) Fleshy fruits
- (b) Dry fruits
- (c) Aggregate fruits

(8) Seed

- (a) Storage of food in seed
- (b) Germination
- (c) Seed dispersal

IV. Classification of Plants

See article above

V. History of the Science

- (1) Its early connection with medicine
- (2) Gradual development and differentiation into subdivisions

Questions

What are the simplest and tiniest of all plants?

What seems to be the function of beautifully colored petals and sweet-smelling nectar?

How does the production of seeds in the maple differ from that in the pine, and what use is made of this in their classification?

How do the insects pay for the sweets they take from the flowers?

What plant family contains a beautiful flower, a deadly poison, and two favorite vegetables?

What favorite children's story is illustrated in the growth of every plant from its seed?

Why do not all the acorns that fall to the ground produce great oak trees?

Describe three things which plant breeding has accomplished.

How important are plants in the life of men and of animals?

What is the name of the great group of plants which is distinguished by having two seed leaves?

Where is the pollen in the flower to be found?

Mention six things which you would miss if the rose family were taken out of the world.

If you see the name *Quercus alba*, what does it tell you?

not to be expected. Had this knowledge been available earlier, much time and labor might have been saved.

The researches thus far referred to deal with the ways in which plants are useful or essential to man. A reverse, but likewise very important relation, results from the fact that nearly all the infectious and contagious diseases of man and of other animals, as well as of plants, are caused by parasitic plants. The great majority of such diseases in man and animals are due to the presence of the minute plants known as bacteria. Bacteria also cause many diseases of useful plants; but many more plant diseases result from the attacks of some of the "higher," or "true," fungi. The prevention or cure of any disease requires an intimate familiarity with the nature and activities of the organism producing it. In connection with medicine, the study of bacteria has rapidly advanced in prominence and significance since its initiation by Pasteur and Koch (see their biographies in these volumes).

An even more rapid development of plant pathology—the study of the diseases of plants—has taken place during the present century. With the growth of plant pathology has come, necessarily, an increased emphasis upon the study of the fungi that cause plant diseases. Already the ravages of many of these diseases have been materially lessened, and the yield of important crop plants has been proportionately increased. Some diseases have been practically eliminated; and knowledge is at hand which will, when it is generally applied, diminish or do away with other diseases. One important phase of the work of plant pathologists has been their coöperation with plant breeders in the production of disease-resistant races of plants. This is a means of combating diseases whose causal organisms (fungi or bacteria) are so widely spread that they cannot be effectively attacked by direct methods.

What has preceded has dealt with the relations of plant study to the physical welfare of man. In more important but less tangible ways, botany, like other sciences, is contributing to man's comprehension of the universe, and thus to his intellectual and moral well-being. It is possible merely to note here that biological thought thus far in the twentieth century has been dominated by two broad conceptions, both

based upon the study of plants. One of these is the theory of inheritance, formulated by Mendel in consequence of his experiments in the hybridization of peas; the second is the mutation theory of evolution, developed out of De Vries' long-continued studies of the evening primroses. See EVOLUTION. C.E.A.

Related Subjects. For lists of the hundreds of plants described in these articles, the reader is referred to the index following the article PLANT.

There are also more general articles which will prove very helpful to the reader interested in botany:

Air Plants	Galls
Air Spaces	Genus
Albumen	Germination
Angiosperms	Gymnosperms
Annuals	Herbarium
Bark	Hybrid
Biennials	Inflorescence
Botanical Garden	Labiatae
Bract	Leaves
Breeding	Leguminous Plants
Bryophytes	Morphology
Bud	Order
Bulb	Osmosis
Catkin	Perennials
Cell	Phanerogamous Plants
Cellulose	Protoplasm
Chlorophyll	Pteridophytes
Composite Family	Pollen and Pollination
Cone-Bearing Trees	Roots
Corm	Sap
Cotyledon	Seeds
Cross-Pollination	Species
Cryptogams	Spore
Deciduous Trees	Spurge Family
Disease (Diseases of Plants)	Stem
Ecology	Umbelliferae
Etiolation	Venation
Evergreen	Water Plants
Exotic	

BOTANY BAY. See AUSTRALIA (History).

BOTARCHA, *bo tahr' kah*. See MULLET.

BOTFLY, one of a family of true flies whose larvae are parasitic in cattle, horses, sheep, and other animals. The common species injurious to cattle, generally called *heel fly* in the South-western United States, is a heavy-bodied, hairy insect that lays its eggs upon the hairs of the animals near the heels, where they hatch quickly. The larvae, known as *ox warbles*, are fleshy grubs. When the eggs hatch, the grubs

penetrate the skin, work their way through the tissues until they reach the back of the host, and there form small lumps, or tumors. They not only damage the hide, but reduce the yield of milk and injure the quality of meat by impairing the animal's health. "Grubby" cattle sometimes die from the effects of the parasites, which have their abode in their hosts about ten months.



Photo Visual Education

TENDRILS, SPINES,
HOLDFASTS, PRICKLES

Stem modifications of the woodbine (tendrils and holdfasts), the rose (prickles and spines), and the grape (tendrils).



HORSE BOTFLY

About twice natural size.

Another species of botfly infests sheep; the grubs lodge in the heads of the animals and cause severe inflammation that sometimes ends fatally. Two species of botfly attack horses. Their larvae live in the stomach, causing serious digestive disturbances. Veterinarians should be consulted as to methods of controlling these parasites. See PARASITE. W.J.S.

Classification. Botflies form the family *Oestridae* in the order *Diptera* (which see).

BOTHA, *bo' tah*, LOUIS (1862-1919), a Dutch statesman of South Africa, leader in his section of the world in the World War. His whole public career was dedicated to the welfare of South Africa, and he succeeded in great measure in realizing his ideals, regardless of racial difficulties. He was the leader of the forces which sought a closer union of the southern provinces; when the Union of South Africa was formed, he headed the delegation to London to urge its acceptance by Parliament, and he became the first Prime Minister of the Union. In the World War, he carried the provinces into the struggle on the side of Great Britain; under his leadership, the conquest of German Southwest Africa was accomplished. He was the representative of South Africa in the Peace Conference in Paris after the war, where his ability was signally recognized. See SOUTH AFRICAN WAR.

BOTHNIA, *bahth' ni ah*, GULF OF, a landlocked sea, extending from the island of Aland northward between Sweden and Finland, forming an arm of the Baltic Sea. It covers an area nearly as large as the state of New York. Commercially and politically, it is of little value. On the east, it is bordered by land devoid of all agricultural advantages; on the north are the barren and Arctic regions of Lapland, and it is only on the southeastern coast of Sweden that land of real value is to be found. Within comparatively recent times, there appears to have been a general rising of the coast line of the gulf and a sinking of the level of the sea. Towns which were at one time seaports are now several miles inland. Navigation is difficult, owing to the presence of many small islands and sandbanks; on account of its shallowness, never exceeding 300 feet in depth, frequent storms quickly cause a rough sea. In the winter, the gulf freezes over, and traffic between Sweden and Finland is carried on by sleighs.

BOTHWELL, *bahth' wel*, JAMES HEPBURN, Earl of (1536?-1578), a Scottish nobleman who is important in history because of his marriage to Mary Queen of Scots and for the events which that union brought about. He won the confidence and regard of the queen after her marriage to Lord Darnley in 1565, and when the latter was murdered, in 1567, he was accused of having had a hand in the affair.

Being summoned to answer the charge of murder, he appeared at the trial with 4,000 of his followers, and was speedily acquitted.

He was then in high favor with the queen, and, with or without her consent, he seized her at Edinburgh, carried her a prisoner to Dunbar Castle, and prevailed upon her to marry him, after he had divorced his own wife. A confederacy was formed against him, and in a short time Mary was brought to Edinburgh a prisoner. Bothwell fled to Norway, from which country he was sent under arrest to Denmark, where he died. See MARY STUART.

BOTTICELLI, *bot te chel' le*, SANDRO (1441-1515), an Italian painter, one of the greatest representatives of the Florentine school during the early Renaissance (see RENAISSANCE). His work, distinguished for breadth of culture, variety of subject, richness and delicacy of coloring, and high imaginative quality, is at all times an expression of his individual moods and ideas. He excelled in painting Madonnas (see MADONNA), and important examples of these may be seen in a private collection in Boston, in the Uffizi Palace, Florence, and in the Berlin Museum. The masterpiece of his early career, a panel representing the *Adoration of the Magi* (in the Uffizi), shows a few traces of the influence of one of his first teachers, Fra Filippo Lippi (see LIPPI, FILIPPO).



Photo Brown Bros.

BOTTICELLI

Summary of His Work. Botticelli was commissioned by Pope Sixtus IV, in 1481, to take charge of the decoration of the latter's new chapel in the Vatican. Three of the frescoes in that chapel—*The Life of Moses*, *The Temptation of Christ*, and *The Punishment of Korah, Dathan, and Abiram*—and several portraits of Popes were painted by Botticelli himself. On his return to Florence, he executed commissions for Lorenzo the Magnificent and other Florentine notables, and for a cousin of Lorenzo he painted some of his greatest canvases portraying scenes from mythology. In the Academy of the Fine Arts, Florence, hangs his most celebrated mythological picture—*Spring*, or *The Realm of Venus*. Of equal beauty is its companion picture, *Birth of Venus*, now in the Uffizi. Both of these canvases are characterized by delicate coloring, grace, and lightness of touch, and richness of imagination. They illustrate also the artist's greatest weakness, his inability to represent correctly the human figure. Among other well-known works are three panels representing episodes in the life of Saint Zenobius, one of which is in the Metropolitan Museum, New York; and a decorative panel portraying the story of Lucretia, in the Gardner collection, Boston.

BOTTLE, a vessel for liquids, usually of glass or earthenware, and generally made with a narrow neck and small opening which can be closed with a cork. In ancient times, bottles were made of skins, and in many parts of Asia and Africa such primitive vessels are still in use. The bottles mentioned in the Bible were probably made of goat skin, sewn as nearly as pos-



AUSTRALIAN BOTTLE TREE

sible in a natural shape, with one leg forming the neck. The chief disadvantage of skin bottles lay in the fact that they affected, and were affected by, their contents. The same objection applied to metal bottles. It was not until glass was utilized that a bottle was obtained which was practically impervious to its contents, no matter how injurious they might be to other materials. Acids that would quickly eat their way through leather or metal vessels produce no effect upon glass bottles.

How Bottles Are Made. In making a glass bottle, the operator formerly took a mass of molten glass from the smelting furnace. This was placed on the end of a hollow metal tube through which air was blown, either from the lungs of the workman or by machinery. For many years, compressed-air machines have practically displaced the workman with robust lungs. (See illustration of bottle-making machines, page 2837.)

When blown out into a pear-shaped hollow, the glass is placed in a red-hot mold the size and shape of the bottle required. The blowing is continued until the glass is forced by pressure of the air into all parts of the mold. It is then cooled and removed, and the neck and mouth are worked to the desired size, and smoothed by special tools. Lettering and other marks on the bottle are made by dies placed in the mold. Bottle-making is one of the most important branches of the glass industries, and has grown to vast proportions. See GLASS.

BOTTLE TREE, a curious Australian tree which has dense foliage and a short trunk which resembles a bottle with bulging sides. The leaves of this tree are long and narrow, smooth-edged, and pointed at the tip. Its flowers grow in short clusters on slender stems, and its fruit is a pod with six seeds. The natives make nets of the fibers and use the sap in the stems as a drink, this latter often having been found useful in times of drought. G.M.S.

Scientific Name. The bottle tree belongs to the family *Sterculiaceae*. Its botanical name is *Sterculia rupestris*.

BOTULISM, *bot' u liz'm*, food poisoning. See SERUM THERAPY.

BOUCICAULT, *boo' se ko*, DION (1822-1890), an Irish comedian and playwright who won extraordinary success as an author of romantic Irish plays and as an actor of eccentric Irish parts. Though he studied to become an architect, he was far more interested in the stage than in his intended profession, and the success of his famous comedy, *London Assurance*, produced when he was only nineteen years of age, made him resolve to seek his fortune in the theater. Other plays followed rapidly, and in 1852 he began to act. In the following year,



Photo: Brown Bros

BOUCICAULT IN CHARACTER PORTRAYAL

he visited America, where his popularity was assured from his first appearance on the stage. Several successful plays were produced in America, among them his famous *Octoroon*.

Returning to London in 1860, Boucicault produced *The Colleen Bawn*. To this play he gave the name "Sensation Drama," and it was the first of those dramas, still popular, that depend upon thrilling effects and situations for their interest. *The Colleen Bawn* earned a fortune for its author. Among others of this type, he wrote *Arrah-na-Pogue* and *The Shaughraun*. With Charles Reade, he wrote the novel *Foul Play*, which was afterward dramatized, and with Joseph Jefferson he dramatized Irving's story of *Rip Van Winkle*, in which Jefferson became world-famous as an actor. In all, Boucicault wrote over 300 dramatic pieces. As an actor, he was not highly gifted, but his keen sense of humor and likable personality made him popular.

BOUGHTON, *baw' t'n*, GEORGE HENRY (1834-1905), an English-American painter of Puritan and Dutch life, whose work shows remarkable fidelity to the subjects portrayed. He was born near Norwich, England, but in 1859 was taken by his parents to the United States, where they settled near Albany, N. Y. At an early age and without a master, he took up the study of art, but later went abroad and studied in Paris. In 1862 he opened a studio in London. His skill and fine sense of color soon gained for him an associate membership (1879) in the Royal Academy, and in 1896 he became a full member. In 1871 he was made a member of the National Academy of Design, New York City.



Photo Brown Bros

GEORGE H. BOUGHTON

His Paintings. Boughton's most popular pictures are the *Return of the Mayflower*, *Puritans Going to Church*, and *Hester Prynne*. His picture of quaint little Dutch girls, entitled *Weeding the Garden*, is in the Tate Gallery, London. His *Edict of William the Testy* is in the Corcoran Gallery, Washington, D. C.

BOUILLON, *boo yoN'*, GODFREY DE. See GODFREY DE BOUILLON.

BOULDER, a rounded stone which has been worn to its shape by water, and is too large to be called a pebble. The name is also given to large surface rocks that were partially smoothed by the action of ice in the Glacial Epoch. Boulders are found on the surface, also embedded in clay and gravel, and in the beds of streams. They are usually of different composition from the rocks in the vicinity, which is evidence that they must have been transported a long distance by ice. When lying on the surface, they are known as *erratic*

blocks. See GLACIER; GLACIAL EPOCH; also ROCK. R.H.W.

BOULDER, COLO. See COLORADO (back of map).

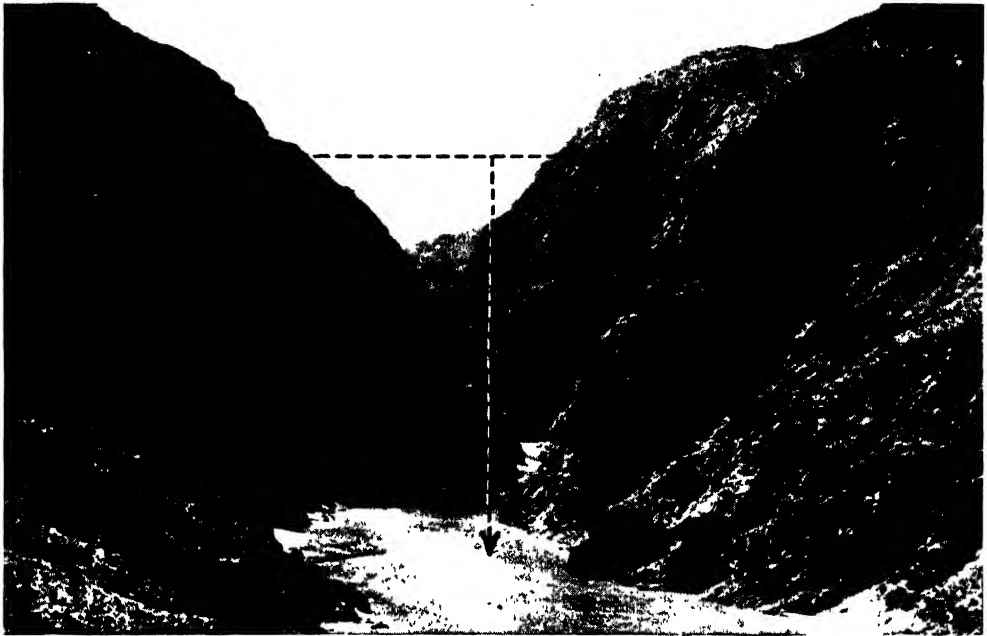
BOULDER DAM PROJECT. The harnessing of the great Colorado River in order to prevent floods, furnish power, and provide water for irrigation, has long been a problem of the states through which the river flows. The proposal to build a dam in Boulder Canyon, on the boundary between Arizona and Nevada, is an effort to solve this problem; it has proved to be one of the most hotly contested pieces of legislation that have been submitted to Congress for many years. It aroused not only the states directly concerned, but because of its implications, became a matter of interest to the entire country.

The mighty Colorado, in its 1,700-mile course, drops 8,000 feet, carrying with it loads of silt, and occasionally bursting forth in violent floods. It was the menace of these floods which first directed definite action toward a division of the waters. In 1922, a conference of representatives of seven states at Santa Fe, N. M., agreed to a compact for the equal division of the waters. The states represented were Colorado, New Mexico, Wyoming, and Utah, of the "upper basin," and Arizona, California, and Nevada, of the "lower basin." Arizona refused to ratify the compact; Utah rescinded its agreement, and California offered to ratify only on condition that a Boulder Canyon dam should be built.

To advance this project, the Swing-Johnson Bill was presented in Congress in 1926, and it was sponsored by California. It provided for the building (by the Federal government) of a dam in Boulder Canyon, between Arizona and Nevada, and below the Grand Canyon. The proposed structure would be 600 feet high; it would provide for storage of twenty-six million acre-feet of water; its cost was estimated at \$41,500,000. The bill also provided for an irrigation canal to water the Imperial Valley, to cost \$31,000,000, and for the erection of a hydroelectric power plant at the Boulder Canyon reservoir. All of the cost, according to the bill's provisions, would be met by the generation and sale of power to private corporations.

The bill was hotly discussed throughout several sessions in Congress. In 1928, a revised bill was passed by the House; filibustering in the Senate temporarily halted its progress.

Arguments for the bill came from those in favor of government ownership of power resources, who said that opposition to the bill was the work of private power interests that sought control of the site for their own exploitation. California continued to push the legislation, urging as its chief argument the need for the protection of the Imperial Valley.



SITE OF THE PROPOSED BOULDER DAM

Dotted lines indicate the width and the height of the stupendous dam which will be built to serve the people of the Southwest

Opposition to the bill was violent from all who were opposed to Federal ownership or operation of such a project. Arizona fought against its passage, because in that state it was felt that Boulder Dam and the canal would deprive Arizona of needed water for irrigation, in order to give it to California. The failure of the states concerned to agree on any plan was one of the reasons for the debates and delay over the proposal; in the early days of 1929 the bill was passed. Work was begun in July, 1930.

BOUNTY, a reward or premium paid from public funds to encourage a certain kind of labor or production calculated to be of benefit to the whole community. The term is also applied to money paid for the extermination of certain destructive wild animals. In the United States, this form of bounty is now seldom offered. In Canada such a bounty is not uncommon; as an instance, the sum of \$15 has been paid by the government for every female wolf destroyed. In Australia, rabbits became so destructive that a small sum was offered for every one killed. In South Africa, India, and many Eastern countries subject to visits of bubonic plague, a bounty is often given for the destruction of rats, for by these filthy animals the dreadful disease is spread. Locusts at times inflict such damage on crops in Africa that governments have put aside large sums to be utilized in taking measures for their destruction.

Industrial bounties are called subsidies (see **SUBSIDY**).

BOUNTY MUTINY. See **PITCAIRN ISLAND**.
BOURBON, *boor' bon*. "They never forgot anything and never learned anything," was said of this ancient family which gave many kings to France, Spain, and Naples. Originally, the Bourbons were lords of the old province of Bourbonnais, in France, but by marriage they became connected with the royal family, and in 1589 Henry of Navarre, a Bourbon, came to the throne of France as Henry IV (which see). Louis XIII, Louis XIV, Louis XV, and Louis XVI were all of this dynasty. This line of rulers was deposed at the outset of the French Revolution, but was restored to the throne in 1815 in the person of Louis XVIII. Charles X succeeded to the crown in 1824, but he was forced to abdicate in favor of Louis Philippe, a member of a younger branch, the Bourbon-Orléans. He, too, was deposed in 1848. His heirs, however, have never given up their claim to the throne of France, and until the World War cemented all factions, there yet persisted in the country a political party which centered around these Bourbon claimants.

In Spain and Naples. In Spain, the Bourbons came to power when Louis XIV of France placed his grandson, Philip of Anjou, on the Spanish throne in 1700. There are to-day in Spain two branches of this famous family, the one in the ascendant represented by the present king, Alfonso XIII. During the two hundred

years and more after the Bourbons began to reign in France, the only break in their rule occurred during the wars with Napoleon Bonaparte. See BONAPARTE, NAPOLEON.

In Naples, the Bourbons came to the throne in the person of Charles III, son of Philip V of Spain, who gained the crown in 1735. His descendants reigned in Naples until 1806, when Napoleon took over the kingdom for his brother. After the downfall of Napoleon, the Bourbon Ferdinand I became king of the Two Sicilies, and the Bourbon line continued to hold the throne until Sicily and Naples were made part of United Italy in 1860.

BOURBON-ORLÉANS, HOUSE OF. See ORLÉANS.

BOURCHIER, *boor sheer'*, ELIZABETH. See CROMWELL, OLIVER.

BOURGET, *boor zhch'*, PAUL (1852-), the author of *The Disciple* and *The Promised Land*, a novelist and critic whose reputation is likely to endure, because of his keen insight into human nature. He was born at Amiens, France, and attended school at Clermont-Ferrand, where his father was professor of mathematics. When he entered the famous College de Sainte-Barbe, he showed marked ability as a student. After graduating from that school, he entered journalism and traveled in many countries, meeting all kinds of people. In this way, he studied character and saw life among the rich and poor. His writings are serious, and deal with the motives which control human actions. Some have said that his work is pessimistic, but this is doubtless because he portrays truthfully everyday life.

BOW AND ARROW, the world's most destructive weapon of offense before the invention of gunpowder. The bow was usually made of steel, wood, bone, horn, or other elastic sub-

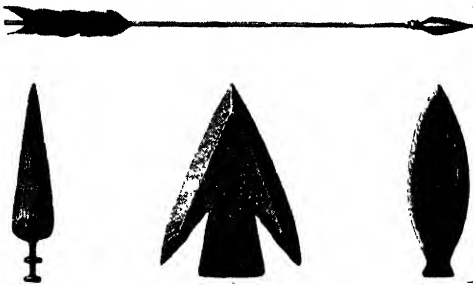
Europe for centuries, was usually the height of the archer, or about six feet in length, and the arrow was a metal-tipped shaft three feet in length. Three feathers near the blunt end of this shaft, doing service as a rudder, kept it in a straight course, point first, and prevented it from turning in the air. In the blunt end of the arrow was a notch which fitted the string of the bow. When the archer made ready for the shot, he placed the arrow across the bow, notch on string, grasped the shaft with the fingers of the right hand, and held the bow with the left arm firmly extended. With a steady pressure the bow was bent until the hand holding the arrow on the string was drawn to the right ear. Suddenly released, the bow snapped back into its former position, and the shaft sped on its mission. The weapons used in modern archery are made on the same principles, but are smaller.

In medieval times, bows were made chiefly of yew, and the importation of yew staves into England was demanded of every merchant, to insure a sufficient supply, for bow-making was an important industry. Laws were passed compelling towns to provide grounds for archery, and in the thirteenth and fourteenth centuries, all other sports were forbidden on Sundays and holidays.

The crossbow was a bow placed in a rest, similar to the barrel of a gun, with a "stock" which was held against the shoulder. The bow was bent, and the string was placed over a trigger which when pulled released it and discharged the arrow, which lay in a groove along the barrel. The crossbow never acquired the popularity of the much superior longbow.

The bow and arrow constituted the typical weapon of the chase employed by the North American Indians before they learned the use of firearms. Their arrowheads were of two kinds, sharp, and blunt or top-shaped. The latter were for the purpose of stunning the prey. The arrow points were made of various materials, including ivory, bone, wood, copper, and stone, and were attached to the shaft by lashing with sinew or riveting with gum. Reeds, canes, ivory, bone, and wood were utilized in making the body part of the arrow. Several varieties of bow were in use, differing in size, material, and shape. In the Arctic regions, where material was scarce, whales' ribs and driftwood were utilized. The Northern Athapascan tribes made long, straight bows of willow or birch; the tribes of the Saint Lawrence region used ash, hickory, oak, and other hard wood, and so on. Sometimes the bows were beautified with painted decorations.

BOWDOIN, *bo' d'n*. **COLLEGE**, the best-known college in Maine, famed as the oldest institution of learning in the state, and numbering among its graduates such distinguished men as Nathaniel Hawthorne, Henry W. Long-



THE ARROW

At top, the Indian war arrow. Below: the first and second arrowheads were for use in war; the third was the usual form employed in hunting.

stance, and was bent into a slight curve, the two ends being joined by a cord. The use of the bow is practically obsolete except in the pastime called *archery* (which see).

The long bow, which was used by English archers, the most-dreaded fighting men of

fellow, Franklin Pierce, Melville W. Fuller, Thomas B. Reed, and Robert E. Peary. The college was chartered in 1794 under the laws of Massachusetts, of which Maine was then a district, and was named for James Bowdoin, a prominent statesman of the period (see below). It was opened at Brunswick in 1802. The Medical School of Maine, opened in 1820, is connected with it.

James Bowdoin (1726-1790) was born in Boston, and was educated at Harvard College. He was an eager patriot throughout the pre-Revolutionary struggle; he served Massachusetts as a representative in the general court, as state senator, and as president of the colonial council. In 1770 he presided with distinction over the Massachusetts constitutional convention, and succeeded John Hancock as governor in 1785. His administration was notable for the energy he showed in putting down Shays's Rebellion (which see). At the close of his term of office, he took part in the proceedings of the Massachusetts convention that ratified the Constitution of the United States.

BOWELS, INFLAMMATION OF THE. See APPENDICITIS.

BOWER BIRD, a name applied to several species of birds native to Australia and neighboring islands. The name is due to the remarkable bowers the males build for the purpose of wooing their mates. The bower birds



THE BOWER BIRD AND HIS PLAYROOM

possess neither brilliant plumage nor the gift of beautiful song, and, lacking these attractions, the male at nesting time invites his chosen mate to a delightful playroom, or bower. In some secluded part of the forest, under the overhanging branches, he has built a wonderful little room with twigs and leaves, decorated with shells, feathers, or orchids. There he dances and bows, like a cavalier in a minuet, until his mate is won. The nests themselves are simple structures, placed in trees. These birds feed chiefly on fruit, and are especially fond of figs. Captive specimens in zoological gardens are interesting objects of study. D.L.

Scientific Name. Some naturalists regard the bower birds as belonging to the same family as the birds of paradise, but a more recent classification

places them in the family *Ptilonorhynchidae*. The best-known species, the satin bower bird, is *Ptilonorhynchus holosericeus*.

BOWERY. For origin of the name of a section of New York City famous in earlier days, see STUYVESANT, PETER.

BOWFIN, *bo' fin*. See DOGFISH.

BOWHEAD, *bo' hed*, a species of whale (which see).

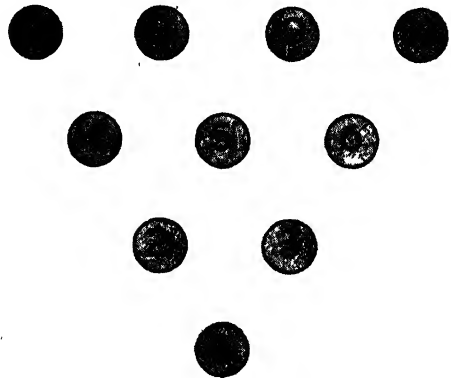
BOWIE, *bo' ie*, JAMES. See ALAMO.

BOWIE KNIFE. See ARKANSAS (Other Items of Interest).

BOWLER, *bo' lur*, the English equivalent for *derby*. See HAT.

BOWLING, *bole' ing*, in an early day called TEN-PINS, is a modern improvement upon the old Dutch game of *skittles*, which Rip Van Winkle encountered in his wanderings in the mountains. It is an indoor game, in which the player tries to roll a large wooden ball down a long, narrow alley in such a way that it will upset ten wooden pins placed in position at the other end. A variation of the game is played with fewer pins. It is an excellent winter sport, requiring the use of practically every muscle in the body, yet it does not subject players to a severe physical strain.

The Alley. The long wooden platform down which the ball is rolled is called the *alley*. It is made of hardwood strips, usually set on edge. The surface is very smooth and highly polished, and it slopes slightly from the center. A regulation alley must not be less than forty-one



POSITION OF PINS IN BOWLING

inches or more than forty-two inches wide. At the players end, a line is marked across the alley; this is the *foul line*, beyond which the bowler is not allowed to step or slide as he rolls the ball. The foul line should be sixty feet from the first pin. Beyond the alley is a small pit, two and one-half feet wide, and back of this is a swinging padded cushion to stop the force of the balls. Alongside the alley are

	NAME	1	2	3	4	5	6	7	8	9	10	ST.	SP.	TOTAL
1	G. C. W.	X	\		\	\		X	X	\	X	4	5	182
2	H. E. R.				X		\	\				1	3	119
3	W. V. M.	X	X	X	X	X	X	X	X	X	X	X	X	300
4														

SCORING A GAME

This is the record of a "three-cornered" match. In the first frame, two of the players made strikes, indicated by the x's. As this entitled them to 10 points plus the number of pins knocked over with the next two balls, no figures were written till after the next turns. In the second frame, G. C. W. made ten points to add to his strike, writing 20 as the score. As this also constituted a spare, an oblique mark was made, no figures being recorded till after the first ball of the third frame. Then 9 was added to the 10 earned by the spare, making the total 19 plus 20, or 39. As he failed to hit the remaining pin with his second ball, only 9 was scored for the third frame. W. V. M. made another strike in the second frame and so was obliged to wait till after the first ball of the third frame before scoring his first frame. As this was also a strike, the score was 30. Both G. C. W. and W. V. M. made a strike in their last frame, so that each had to roll two extra balls. As shown by the score and the marks, one made a spare and the other rolled two strikes. The score of W. V. M. was perfect. Very few perfect scores are ever recorded.

shallow gutters, into which the balls drop if they are not properly rolled.

The Pins and Balls. The pins are set up in triangular formation, and are twelve inches apart. The last row, of four pins, must be three inches from the end of the alley. Each pin of regulation size is two and one-quarter inches in diameter at the bottom and fifteen inches long, and has a maximum circumference of eleven and five-eighths inches. The weight of each pin must be at least three pounds and two ounces.

The balls are sometimes of wood, but usually are made of a hard-rubber composition. They are in several sizes; the largest are twenty-seven inches in circumference and weigh sixteen and one-half pounds. In each ball there must be two small holes, into which the thumb and a finger are inserted, to give a firm grip; sometimes, however, balls with three finger holes are used.

Scoring. A game consists of ten frames; each player is allowed to bowl two balls in each frame, and he is credited with the total numbers of pins knocked down in the two attempts. If he knocks down all the pins with the first ball, it is called a *strike*; if he knocks them all down with the two balls, it is a *spare*. If the bowler makes a strike, he adds to the ten thus scored the number of points scored on the next two balls that he rolls. If he rolls three strikes in succession, he scores thirty in the first frame. A perfect score, comprising nothing but strikes, is 300; this is a feat that is seldom accomplished. If the player makes a spare, he adds to the ten thus scored the number of pins bowled over on his next ball. The example herewith will show how the scoring is done.

Bowls, or Lawn Bowling. This game has been popular in the British Isles since the thirteenth century, and may have been played there earlier. It has little resemblance to the

indoor pin bowling just described, but is similar in principle to curling and to shuffleboard (both of which are explained elsewhere in this work).

A bowling green is a smooth grass plot about forty yards square. Usually it is level, but is sometimes built with a *crown*, the center being a foot or more higher than the edges. *Rinks* six or seven yards wide are marked off, so that several games may be played at the same time. The word *rink* also refers to a team, just as in curling. Each green is surrounded by a ditch.

The object of a rink is to roll its balls as near as possible to the *jack*, a white earthenware ball about two and one-half inches in diameter. The bowls are made of wood, about five inches in diameter, and weigh not more than three and one-half pounds. They are made with a *bias*; that is, one side of a bowl is more convex than the other, so that unless thrown with great speed it will curve as it rolls. On a good green, a bowl may curve six feet from a straight line. It is this bias which is the excuse for Shakespeare's pun in *King Richard II*, act III, scene 4:

QUEEN What sport shall we devise here in this garden,
 To drive away the heavy thought of care?
LADY. Madam, we'll play at bowls.
QUEEN. 'Twill make me think
 The world is full of rubs, and that my
 fortune runs against the bias.

To start the game, the first player of one side, called the *lead*, stands with one foot on a rubber mat and throws the jack twenty-five yards or more. He then throws his first bowl as directed by his *skip*, or captain. His first opponent follows, then the second man of his own side, and so on, the skips throwing last. Each player endeavors to place his own bowl in a good position, or to dislodge an opponent's bowl or the jack, or to guard a previously thrown bowl of his own team. In a match

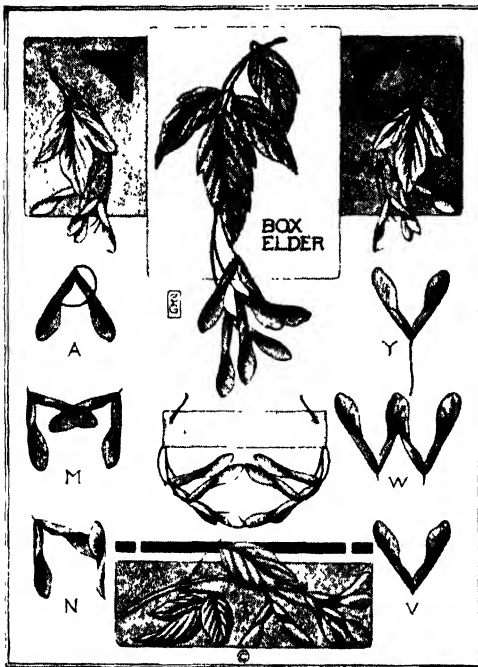
game, each player throws two bowls, but in a friendly game, four. Then the rink which owns the bowl resting nearest the jack scores one. Twenty-one points are a match. Sometimes a point is given for each bowl nearer the jack than the nearest of the opponent's bowls.

Scotch and English rules differ as to the treatment of bowls or a jack knocked into the ditch. The Scotch, too, have a game of points which is entirely distinct from the regular game, except that it is played with the same objects on the same greens.

Lawn bowling is better known in Canada than in the United States. In Great Britain there are many clubs. One in Southampton was founded in 1299, and has played on the same green for centuries. Bowlers from Canada and Great Britain have met in international matches in both countries, and Australian and New Zealand players have visited England.

Related Subjects. For other recreations, see list of titles at end of articles AMUSEMENTS and GAMES AND PLAYS

BOWLING GREEN, KY. See KENTUCKY (back of map).



SUGGESTIONS FOR BOOKLET COVER

Small designs may serve as initial letters; at the bottom is a tail-piece ornament. The illustration at the top, with the border and central figure, makes an attractive cover design.

BOX-ELDER, OR ASH-LEAVED MAPLE, a rapidly growing species of maple which may be distinguished from other maples by its leaves. These are compound, while the typical

maple leaf is simple, though often deeply lobed (see LEAVES). As its secondary name indicates, the box-elder bears leaves somewhat like those of the ash (which see). In manner of growth, however, its foliage suggests the elders, and the real clue to its botanical character is the fruit, a flattened key. Early in summer, the box-elder produces true maple keys, as shown in the illustration. The tree is widely distributed in the United States; it was extensively planted as a windbreak by the Western settlers, because of its spreading habit and rapid growth. It is not one of the best shade trees, however, because it breaks off easily and is apt to become unsightly in maturity. The box-elder reaches a height of fifty to sixty feet. Its soft, close-grained wood is used for wooden ware, paper pulp, and furniture. See MAPLE; ELDER (for classification). G.M.S.

Scientific Name. The scientific name of the maple family is *Aceraceae*. The box-elder is *Acer negundo*

BOXER REBELLION, an anti-foreign uprising in China in 1900, instigated and chiefly carried out by a native secret society known to Europeans as the "Boxers"—an incorrect translation of their Chinese name, which means "The Fist of Righteous Harmony."

The Western powers, after the defeat of China by Japan in 1895, began an aggressive policy of securing concessions, or trade advantages, and of establishing "spheres of influence"—all this with so alarming a rapidity that the Chinese felt that the independence of their country was threatened.

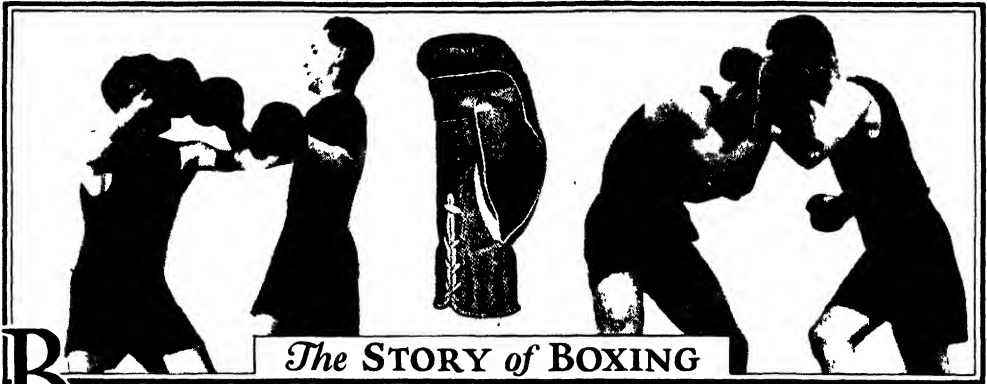
Under the control of fanatics, whose cry was "Down with the foreign devils!" the Boxers began their agitation against missionaries in Northern China, and soon Peking was in the hands of a mob which threatened the foreign legations.

On June 10, 1900, a relief force of 2,000 marines left the foreign warships at Taku, with Peking as its destination, but it was driven back. The situation in Peking became desperate. The secretary of the Japanese legation and the German ambassador were murdered in the streets, and there remained little doubt that the Boxers were encouraged by the Chinese government. For two months the foreign diplomats and their families, together with a number of missionaries and Christian Chinese, were besieged within the walls of the British legation. At last, on August 14, they were relieved by a force of 18,000 men sent from Taku. Exactly two weeks later, the allies—Japanese, Russians, British, Americans, French, and Germans—marched through the Forbidden City, in whose sacred royal precincts no foreigner had ever stepped. Like assaults occurred in Tien-tsin.

Peace was made on September 7. China agreed to pay \$330,000,000 indemnity, which was to be distributed among the allies;

membership in any anti-foreign organization was forbidden under penalty of death, and the importation of arms or ammunition was prohibited. Arrangements were made for a fortified district for foreigners in Peking, and for its direct, open communication with the sea. The United States government remitted one-half of

its total indemnity in 1908, and the money was afterward used to send Chinese students to the United States for education. In 1924, the United States, Russia, Great Britain, France, and Japan remitted the remaining portions of their share in the indemnity, to be used for educational purposes in China.



The STORY of BOXING

BOXING, called the "manly art of self-defense," is the art of hitting an opponent without getting hit. In popular use, the term boxing is associated with friendly exhibitions of skill rather than with public prize-fights between professionals. Professional boxing is discussed in the article PRIZE-FIGHTING (which see).

Boxing in ancient times was one of the most brutal of sports. Practically no rules existed, and wrestling was an important part of the conflict. The boxers wore either no gloves at all or a pair of bronze (brass) knuckles, and they fought until one was knocked insensible. It was not until after 1795 that boxing gloves were introduced, and then only for sparring matches. All boxers now use padded leather gloves, usually weighing six to eight ounces, partly to protect their hands and partly to prevent serious injury to each other.

Marquis of Queensberry Rules. The modified form of the Queensberry rules, which were adopted in 1867, are now in force throughout the world. Their first purpose was to eliminate the brutality of professional prize-fighting and make boxing a sport.

These rules, slightly changed, now apply both to professional and to amateur boxing. They require a "fair, stand-up" match, with no wrestling or clinching allowed. Each round is three minutes long, and the intermission between rounds is one minute. If a boxer falls, either from weakness or from a blow, he is allowed ten seconds to rise, without assistance. If he is not on his feet as the referee counts ten, the boxer is said to "take the count," and he loses the contest. The American Amateur Athletic Association adopted the Queensberry

rules with only a few minor changes. It fixed the maximum weight of gloves at eight ounces, and the size of the "ring" in which the match takes place at sixteen to twenty-four feet square. Under English rules, the ring may be as small as twelve feet square.

Boxers are divided by weight into six different classes, the maximum weight for each class being as follows: Bantam weight, 105 pounds; feather weight, 115 pounds; light weight, 135 pounds; welter weight 145 pounds; middle weight, 158 pounds; heavy weight, over 158 pounds. For example, if a man's weight increases from 105 pounds to 107 pounds, he becomes a member of the feather-weight class, remaining in that division until his weight exceeds 115 pounds. Boxers in each class usually arrange matches only with others in their own class, but it is not unusual for a man to advance from a lighter to a heavier class.

Technique of Boxing. The object of boxing is to deliver blows and at the same time protect oneself from attack by an opponent. Every experienced boxer develops an individual, characteristic style, certain defensive positions which allow him to use his strength and skill to best advantage. The beginner, however, should adhere to the accepted principles, and not try unnatural poses until he has mastered at least the rudiments of the art.

The boxers face each other, just out of reach. Most boxers stand with the left foot in advance and slightly turn the left side of the body toward the opponent. Beginners should assume an upright position. Professional boxers, especially in the United States, often assume a position called the *crouch*, in which the body is bent toward the right, while

the left arm is stretched out toward the opponent. The left arm is used to make the most leads; the right delivers the heavier blows.

The attack may be made in several ways. First is the *straight lead*, a hard blow straight from the shoulder without preliminary feinting. A feint is an attempt to throw the opponent off his guard, as, for example, by apparently aiming with the right hand at his head, while really planning to strike him with the left above the stomach. A *counter* is just like a lead, but is delivered at the same time that the opponent attempts to strike; it is really a *counter-lead*. A counter may be, and usually is, delivered in connection with a rapid change in position, such as a step to one side or a drop from a standing to a crouching position. A *cross counter* is a blow usually delivered with the right hand, which goes over the opponent's left arm as he counters a left lead, or as he leads his left.

Guarding may be done in various ways, usually with the arm or hand. If a blow is stopped by the guard, it is said to be *blocked*; otherwise it *lands*. A blow may be avoided by a quick duck of the head. It may also be pushed to one side, so that its force is delivered only against the body. This is a valuable device, for if the opponent's blow is partly blocked and glances off, he is nearly always slightly off his balance and himself exposed to a stiff blow.

Some Advantages of Boxing. As a form of physical exercise, boxing is of undeniable value. Not only are the muscles of the arms, legs, and back developed, but the various positions assumed in attack and defense bring into play all of those movements which serve to increase the agility of the boxer, make him light on his feet, and develop control of his body. Moreover, he receives training in mental alertness as he practices the art of "hitting without getting hit." Boxing is excellent for mental discipline, and it also has a part in the development of character, for under right conditions it brings out the finest qualities of sportsmanship—courage, honesty, the ability to be a "good loser," and to control the temper in all situations.

Some Technical Terms. Below is a list of some special terms used by boxers and not already mentioned:

Break Away. Usually the call of the referee when the two are in a clinch.

Breaking Ground. To retreat diagonally from right to left.

Clinching. To catch hold of an opponent in such a way that he cannot swing his arms. This is a common device, employed when a boxer is slightly dazed from a blow and wants a moment for needed rest without danger.

Corners. The corners of the ring. Each boxer has his own corner, diagonally opposite that of his opponent, to which he retires between rounds. The other corners are called neutral corners.

Cross-Counter. A blow in which the arm crosses the opponent's lead.

Drawing. Apparently leaving an opening for the opponent, but really preparing a counter-attack.

Fiddling. The preliminary motions at the beginning of a round, each boxer maneuvering for an opening.

Foul. Hitting below the belt, or with the palm, or back of the hand. Kicking, tripping, wrestling, and unnecessary roughness also constitute fouls. If the foul is a serious one, the referee usually awards the match to the boxer against whom the foul was committed.

Hook. A sharp blow from the side, with the arm bent.

In-Fighting. The boxers are too close to swing, and full-body blows or blows straight from the shoulder are also prevented.

Lead-Off. The first blow; or sometimes a straight lead.

Return. A blow after the opponent's blow has been blocked or avoided.

Second. Each boxer may have one or two assistants, who wrap him in blankets, fan him with towels, or otherwise help him between rounds.

Solar Plexus. The pit of the stomach. A powerful blow landed here almost always means a knock-out.

Swing. A swinging blow from the side. Usually the boxer jerks his body in the same direction, to give the blow greater force.

Throw Up the Sponge. When a boxer or his second tosses his sponge into the ring, it is an acknowledgment of defeat.

Uppercut. A short, sharp blow from below, aimed at the opponent's chin. If successfully delivered, it knocks him off his balance and may even knock him out.

BOXING THE COMPASS. See COMPASS.

BOX TORTOISE, OR BOX TURTLE. See TURTLE.

BOX TREE, OR BOXWOOD, a shrubby evergreen tree, twelve or fifteen feet high. The leaves are small, oval, leathery, and deep green. The flowers are inconspicuous; male and female blossoms are on the same tree. It is a native of England, Southern Europe, and parts of Asia. Formerly very common in England, it has given its name to several places—Boxhill, in Surrey, for instance, and Boxley, in Kent. The wood is of a yellowish color, close-grained, very hard and heavy, and it takes a beautiful polish. It is therefore much used by wood turners and carvers, engravers on wood, and makers of mathematical instruments. As far back as the times of Pliny, it was used to make flutes and other wind instruments.

The boxwood of commerce comes mostly from the regions adjoining the Black and Caspian seas, and is said to be diminishing in quantity. In gardens and shrubberies, box trees may often be seen clipped into various formal shapes. There is also a dwarf variety, reared as a hedge for garden walks and lawn borders. In America, this plant is grown mainly along the Atlantic coast from Massachusetts to South Carolina.

G.M.S.

Scientific Name. The boxwood belongs to the family *Buxaceae*. Its botanical name is *Buxus sempervirens*.

BOYCOTT, the name given to an organized movement to injure or ruin the business of a person by refusing to deal or associate with him. The name is taken from that of an English land agent, Captain Charles Boycott, whose harsh measures against the Irish tenants of his employer, Lord Erne, caused the people for miles around to refuse to have anything to do with himself or his family.

In trade disputes, the boycott was until recently a favorite weapon of combinations of trade-unionists or workmen, who sought thereby to injure an employer's business so that he would accede to his employees' demands or suffer penalties for refusing to do so.

Public opinion has opposed such policies so strongly that the boycott is no longer employed. Indeed, in many states it has been the subject of adverse legislation.

BOYER RIVER. See IOWA (Its Waters).

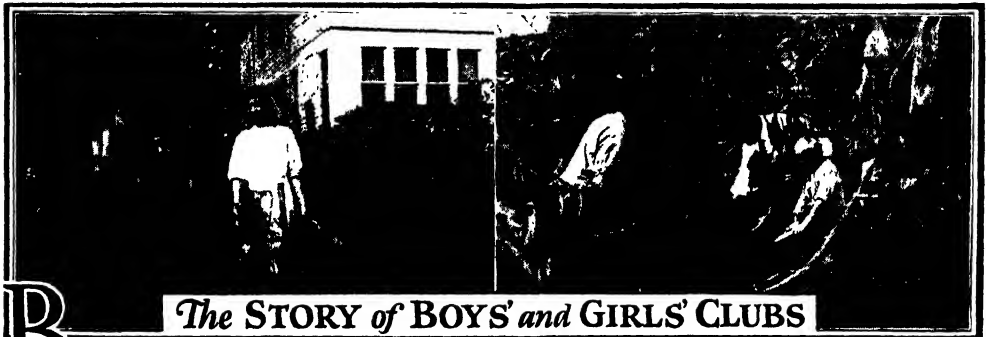
BOYLE'S LAW, also called **MARIOTTE'S LAW**, the law governing the elasticity of gases. See GAS; ELASTICITY; HYDROSTATICS.

BOYNE, *boin*, **BATTLE OF THE**, in English history, the battle which decided that England's rule should be dominant in Ireland. It was fought in 1690, on the banks of the

weedy River Boyne, near Drogheda. There the army of William of Orange (William III of England) met the forces of James II, last of the Stuart kings, and over them gained a decisive victory (see STUART, HOUSE OF).

The reign of the Protestant Queen Elizabeth had forced the Protestant faith upon all Ireland, though the majority of the people were Roman Catholics. During the years that followed, there had been several unsuccessful attempts to throw off the English yoke, and when James II, himself a Roman Catholic, came to the throne, he helped the Irish cause by giving to the Roman Catholics the civil government and military power of the island. See JAMES II.

The Revolution in 1688, which dethroned James and gave the English crown to William of Orange, was the signal for another Irish rebellion, and James was invited by its leaders to join cause with them. Accordingly, he landed in Ireland in the spring of 1689 with a small French force loaned by Louis XIV, and established his headquarters at Dublin. The year following, he suffered an overwhelming defeat at the Battle of the Boyne. In 1691 the unfortunate war was terminated by the Treaty of Limerick. An obelisk 150 feet high marks the site of the battle, and Irish Protestants celebrate July 12 as the anniversary. See WILLIAM III; IRELAND (History).



The STORY of BOYS' and GIRLS' CLUBS

BOYS' AND GIRLS' CLUBS. In many communities there exist clubs devoted to the manifold interests of the nation's boys and girls. Some of these are designed to promote social activities; some are literary in character; others, more numerous, are confined to rural communities, and are variously designated as corn clubs, garden clubs, poultry clubs, and the like. Those whose interests are purely local may well be dropped from consideration in an article designed to be of particular value to the youth of the entire nation.

The paramount club development for boys and girls in America centers around the farm. The soil is the basis of life itself; mother's kitchen is a business center of organized domestic life. The people are directly depend-

ent upon these two interests in life for their existence, and the entire human race constitutes a common brotherhood through those twin benefactors, *crop production* and *house-keeping*. It is no wonder, then, that we have developed through these two interests a type of education commonly known as "boys' and girls' club work," an agency for the perfecting of real democracy. Club work makes a particular phase of education possible to all; it takes facts from school, classroom, laboratory, and experiment station, and gathers a variety of information from books, bulletins, and institutions. It carries to every home, regardless of its remoteness from class room or college, by means of this extension agency and through a program of follow-up work, printed instructions,

field meetings, demonstrations, and personal direction. Paid leaders or itinerant teachers through this means make education universal, and common knowledge more readily becomes common practice.

Beginnings of the Movement.

The boys' and girls' club work in rural communities had its inception in Wright County, Iowa, in 1905-1906; its origin is credited to the county superintendent of schools of that time, and it was sponsored by the schools of the county. Later, the work was promoted by a few county superintendents of schools in Iowa, Illinois, Indiana, and Ohio.

The movement, however, made little or no permanent progress within these states until the colleges of agriculture, through their extension departments, assumed definite leadership of the movement and made the project statewide in scope.

The early development of the work with young people was fraught with considerable difficulty, in that the leaders looked upon the movement as a temporary agency through which to exploit the benefits of a college, or to make it possible to advertise, and also to popularize more rapidly, the work for adult farmers. Consequently, much of the work was outlined on a basis of temporary contests in crop production, the making of big yields, and the exhibiting of corn, vegetables, and chickens at county and state fairs. No adequate follow-up system was made available for the work. State appropriations for extension work were used in the promotion of the work for men, and so the work for young people was not provided with the paid leadership needed, and very little definite direction was given to the movement.

It remained for the United States Department of Agriculture, in the year 1908, to launch the club work as a permanent and worth-while coöperative educational movement. This was first undertaken in the state of Mississippi, in coöperation with the county superintendents of schools; later, the movement spread to all the states of the Union, and was supported by Federal and state appropriations. Under the terms of the Smith-Lever Act, it became a definite agency with a fixed policy of extension education, the work being carried on coöpera-

tively by the United States Department of Agriculture and the state colleges of agriculture, through the States' Relations Service.

To enlist boys and girls of rural communities

in club work which would take on national significance and provide inspiration beyond that possible in purely local or state activities, the name "boys' and girls' clubs," a rather indefinite term, has been abandoned, and the Coöperative Extension Work of the United States Department of Agriculture has merged all rural club activities into one great national organization, known as "The Boys' and Girls' 4-H Clubs," and these operate to connect the individual on the farm with county, state, and Federal authority.

[See subhead *Emblem*, later in this article, for explanation of "4-H."]

Boys' and Girls' 4-H Clubs

A Federal Enterprise. The 4-H club work is a publicly supported and publicly directed educational enterprise of the United States Department of Agriculture, and it has the coöperation of state agricultural colleges and county governments. It is designed to teach through doing, and is organized to promote better practices in agriculture and home economics and the finer things in rural life; at the same time, it develops wholesome, industrious, public-spirited boys and girls.

Membership and Activities. Membership in 4-H clubs is voluntary. One of the essentials of membership is that each boy or girl who takes up the work shall learn and demonstrate some better practice in agriculture or home economics under the guidance of a competent leader, keep a record of this work, make a public exhibit, and report on it to the county extension agent.

Members of 4-H clubs are associated in groups of five to fifty or more. These clubs are conducted in accordance with parliamentary practices. The club program usually flows from and centers about the work the boy or girl is doing in the home. The program is enriched by demonstrations, exhibits, songs, games, yells, music, and social activities. Tours about the county to study livestock,



U. S. Dept. of Agriculture

INTERESTED IN FORESTRY

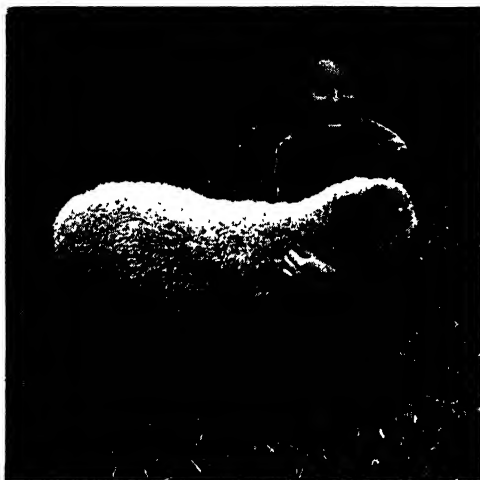
A club member examining two-year-old seedlings after transplanting. (Photograph from Merrimack County, N. H.)



Activities of Girl Members. A girls' sewing club in Boulder County, Colo. Below, in Virginia, a home-demonstration agent aiding sewing-club members in the selection of material for clothing.

farm crops, home improvements, etc., are often made a part of the club activities.

In summer, county, district, state, and sometimes regional camps of about a week's duration are held. Usually, once a year from 250 to 2,500 outstanding representatives of the clubs are brought to their state agricultural college for a week's instruction and inspira-



U. S. Dept. of Agriculture

STORY OF A GIRL MEMBER

A Connecticut club member and one of her ewe lambs. She had a love for outdoor life, and began 4-H Club work in 1910. She now has a profitable flock of pure-bred Shropshire sheep, and has raised chickens, ducks, pigs, and a Jersey heifer; the latter has won many prizes at fairs. She also breeds skunks and Persian cats.

This girl borrowed money at the bank to buy her first sheep, paid the note promptly, and established her credit, which she uses whenever necessary. She displays remarkable business acumen in the disposal of her products. She is a living demonstration of the opportunities open to any boy or girl through 4-H Club work.

tion. At these camps, matters that make for character, appreciation of nature, and pride in rural life and accomplishments are stressed.

In club work involving poultry, dairying, beef cattle, sheep, hogs, and sometimes various field crops, club members are taught matters of finance, marketing, exhibiting, demonstrating, coöperation, and like matters. They are associated with bankers, breeders, college teachers, merchants, and the public in worthwhile enterprises, and are taught the ethics of business. Through club work, rural coöperation is taught, and rural leadership is developed.

The club age is ten to twenty years, with stress placed on the years twelve to eighteen. The total membership throughout the United States is now nearly 600,000.

The ultimate objectives of 4-H club work are a prosperous, capable, and contented rural people, men and women who find joy and

satisfaction in growing crops and in animals, the plants of the field and the woods, the wild life of forest and stream, the winds, the rain, and the soil; to develop on the farms and in rural communities a cultured, wholesome life, with interests extending outside the community into the affairs of state and government, and to do these things in substantial measure through the agency of boys' and girls' club work.

Emblem. The emblem of the 4-H club work is the four-leaf clover (the "good luck" design), with an H inscribed on each leaf. They signify the equal development of the head, the hand, the heart, and the health of each club member. The pledge of each club member is as follows:

I pledge—

my *head* to clearer thinking,
my *heart* to greater loyalty,
my *hands* to larger service, and
my *health* to better living,

for my club, my community, and my country.

Supervision. Every state in the Union has now a corps of paid coöperative leaders, and a



U. S. Dept. of Agriculture

A MINNESOTA CORN-CLUB BOY

He is proud of a bushel of selected seed corn.

total of from four to forty club leaders are now coöperatively employed in each of the states of the Union. In addition to this body of workers, there are four county agricultural agents, both men and women, in most of the counties of the Union, who serve the people in a very practical way in the interests of better agriculture and home-making. A corps



Busy Boys in Oregon and Iowa. The smiling owner of a pure-bred Jersey calf; a club member counting his new fortune in pigs.

of specialists, supervisors, and directors in various phases of extension work are also engaged in this extension service. All of these contrib-



A CLUB GIRL
Making use of a neglected yard.

ute a great deal of their time to the promotion of the work.

Play, Contest, Achievement. No system of education designed for training boys and girls is complete until it properly recognizes the *place of play*, and offers an opportunity for children to measure themselves by *contest methods* with their fellows. No sound system of education has yet been devised or offered to the public which does not properly recognize the dual powers for child development, namely, *play and contest*, as a means for training in efficiency and as a motive for working out standards or industrial measurements with young people.

The next stage in the 4-H club program is to secure the proper measurements of the club achievements in yield or products, and have the club members submit signed and properly certified reports to the county, district,

or state leaders. Anyone who has followed this particular phase of the work will understand its importance, and will appreciate that the training a child gets in cost accounting alone is worth all the time and money which is being spent for boys' and girls' 4-H club work; for in the home as well as upon the farm, the work of keeping books, records, and cost accounting has been greatly neglected, and some "first aid" to this phase of farming can easily be administered through the club work. See **BOOKKEEPING (Farm Bookkeeping)**.

After the measures have been taken and children graded upon the basis of their achievements by a competent committee, the winners are then called together and banqueted or given a reception by the business men, farmers, grangers, federations of women's clubs, or some other organization of the community.

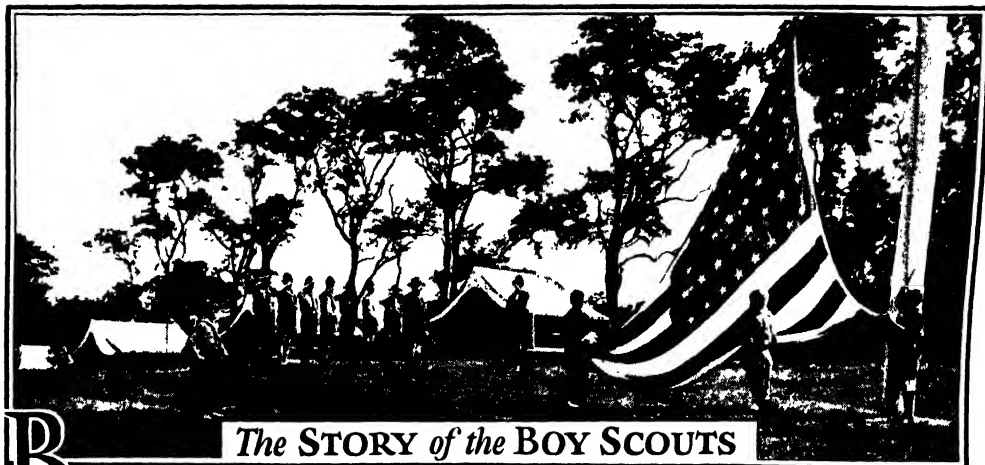
In a number of the states, *club achievement days* are held, on which a carefully planned achievement program is carried out in the interest of the young people. Members are called upon to give reports, illustrate methods of winning, and to tell their own stories of "How I Made My Crop," "How I Raised My Chickens," "How I Kept My Records," "How I Canned and Marketed My Surplus," etc.

Leaders also make their awards of diplomas, medals, scholarships, educational trips, pennants, pure-bred farm animals, bank deposits, etc., to those who have reached the standard of highest achievements. In this way, common work is dignified, and is made both interesting and attractive to all the young people. Heroes in the industrial army are thus honored, and they become "guiding lines" for others of their class. O.H.B.



A BOYS' CLUB
4-H apple-club members receiving instructions from
a county agent.

Where to Seek Information. Outlines of procedure in connection with all phases of 4-H Club work—varied programs or projects, plans for contests, and the like—may be obtained from the United States Department of Agriculture, Washington, D. C., or your state agricultural college.



B The STORY of the BOY SCOUTS

BOY SCOUTS OF AMERICA, an organization with a program of work and play for boys, international in its scope, which has won for itself this commendation: "No movement of our time toward child betterment has been more practical than the Boy Scout movement." All boys between the ages of twelve and eighteen may become Scouts, if they fulfill certain requirements; this step gives them an opportunity for training in resourcefulness, self-control, thrift, courage—in fact, almost all the virtues that make for efficient manhood and good citizenship. Through the Scout activities, the energy and group spirit which, if undirected, might lead to lawlessness and the "gang," are directed toward channels of safe expression.

History. The Scout movement was founded by Lieut. Gen. Sir Robert Baden-Powell in England in 1908. In 1909, through the "good turn" of an unknown British Scout, the Scout idea was brought to the United States by W. D. Boyce of Chicago. The society was incorporated on February 8, 1910, a date which has ever since been observed by Scouts throughout the United States with appropriate ceremony. In 1916 the Boy Scouts of America was granted a Federal charter by Congress. It was one of four such organizations chartered; previous to 1910, both Daniel Carter Beard and Ernest Thompson Seton had done pioneer work for boys along similar lines.

The Boy Scout movement is now organized in over fifty countries of the world, with a membership of nearly 2,000,000. The membership of the Boy Scouts of America exceeds 815,000.

The Boy Scouts of America is neither military nor anti-military. It emphasizes the boy's religious obligations, but is entirely non-sectarian, and is endorsed by churches of the Protestant, Catholic, and Jewish faiths.

Publications. In 1910 the original edition of the *Handbook for Boys* was published. This was followed a year later by a new edition,

proof of which was submitted to educators, social workers, and religious leaders throughout the country. Perhaps no other book has had a larger number of editors. In 1927 a revised edition was issued. Over 3,500,000 copies of this *Handbook* have been sold, and it is in



THREE FAMOUS BOY SCOUTS

From left to right, meet David R. Martin, Jr., Minnesota, Robert Douglas, Jr., North Carolina, and Douglas L. Oliver, Georgia. These boys were given the honor of a trip to Africa, where they hunted with cameras in Tanganyiki.

constant demand, not only for boys but for all people who live much out-of-doors.

Boys' Life is the official Boy Scout magazine for boys, and *Scouting*, the publication for Scout leaders. In addition, the Boy Scouts of America publishes other manuals, including *Handbook for Scoutmasters*, *Community Boy*

Leadership, Swimming and Water Safety, Sea Scout Manual, Winter Camping, How Book of Scouting, Boy Scout Diary, and Tracks and Trails, besides nearly a hundred technical and vocational pamphlets in the Merit Badge series, and about three-hundred pamphlets of general and Scout interest, known as the Boy Scout Service Library.

Awards. The National Court of Honor recognizes the courage of Boy Scouts by awarding the gold Honor Medal and the Certificate of Heroism to Boy Scouts who save life at imminent risk of their own. Nearly 1,400 of these awards have been made since 1911.

The Harmon Foundation of New York presents annually fifty-two awards of \$100 each to Eagle Scouts, for outstanding service to the community. These awards are to be used for higher education.

The Wild Life Protection Fund presents gold medals and gold honor badges to Scouts, for service in wild-life conservation.

Many schools and colleges present scholarships to Boy Scouts.

Purpose and Methods. The Boy Scout method is summed up in the term *scoutcraft*, which includes first aid, life-saving, tracking, signaling, and dozens of other accomplishments, most of them pertaining to outdoor life. A Scout spends days in camping—sometimes with large groups in a permanent camp, and often with a smaller group or his own patrol in a temporary camp. He goes on long hikes with his patrol, studying birds, trees, and rocks as he goes; he learns to swim and to row a boat. In these and other activities, he learns self-reliance, resourcefulness, and courage, and he develops a healthy body and mind. He brings to the artificial life which civilization practically forces him to enter a wealth of the resources and the abilities which were those of the pioneer scouts of long ago.

Before he may become a Scout, a boy must not only have learned the Scout Oath and the Scout Law, but must be prepared to live them every day. In the Oath, he declares:

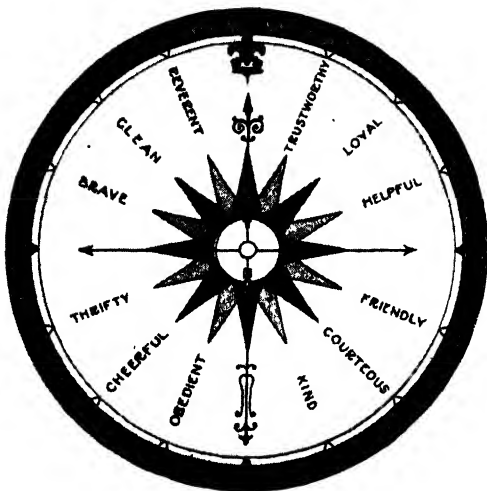
On my honor, I will do my best:

1. To do my duty to God and my country, and to obey the Scout Law;
2. To help other people at all times;
3. To keep myself physically strong, mentally awake, and morally straight.

The Scout Law which he must obey is divided into duties toward God, country, fellow-men, and himself, and is so divided on the "compass" shown herewith.

The idea of service is inherent in the whole Scout movement, from the personal service of the principle, "Do a good turn daily," to the greatest service to community and country, which is the part of a good citizen. The "good turn" of a single Boy Scout may not pass

beyond the notice of one or two people, unless it is a deed of real heroism. But the larger service which Boy Scouts render—their leadership in "clean-up" drives, service as traffic guides, and police aides in large gatherings, their help in reforestation and other conservation projects—is evident to the public. So was their great service during the World War in the



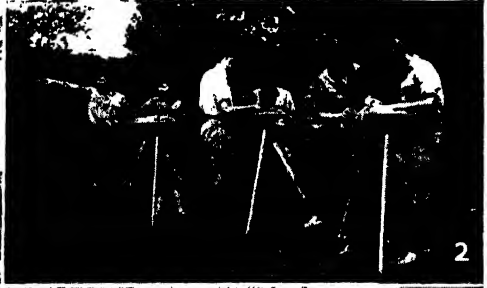
THE SCOUT COMPASS

The Scout Compass has four cardinal points similar to the mariners' compass. By this compass the scout finds his way over Life's Sea, as the mariner by the aid of his compass pursues his course on the high seas. At the center of the compass, as the pivotal point, we have the Scout pledge "To do his Best." The "scout's honor" is the needle which always points to his "scout duty."

At the north pole of the Scout Compass, we have "Duty to God"; at the point of the rising sun, "Duty to Country"; at the south pole, "Duty to Others"; and at the setting sun, "Duty to Self." Between the four cardinal points, we may plot the twelve Scout Laws.

selling of Liberty Bonds and in the planting of war gardens, and their self-effacing devotion to duty in the time of great disasters like the Florida hurricane and the Mississippi flood. The Boy Scouts of European countries also rendered distinguished service during the World War.

Tests of achievement and character must be met, in order that a boy may pass from one to another of the three classes of scouts. In order to become a Scout, that is, a *Tenderfoot*, he must know the Scout Oath and Law; the motto, "Be Prepared"; the sign, the salute, and the significance of the badge; the history of the flag of the United States of America and the customary forms of respect due to it; and must be able to tie nine specified knots. He may then take the Scout Oath and be enrolled as a Tenderfoot Scout. He must be in the organization for one month before he can become a Second-class Scout, and he must



Boy Scout Activities. Tying knots is a useful lesson. Map-making and surveying combine vocational training with outdoor life. Archery develops poise and accuracy. Fire-fighting. "A Boy Scout is clean" (camp inspection)

pass tests in first aid, signaling, or Indian sign language, observation or tracking, building a fire and cooking food in the open, and learning the sixteen points of the compass; and he must earn one dollar and deposit it in a public bank.

The rank of First-class Scouts is to be attained only after considerably more difficult requirements are met, and by enlisting a boy whom the Scout has trained in the requirements of a Tenderfoot. For both Second- and First-class rank he must also furnish satisfactory evidence that he has put the Scout Law into practice in his daily life. Especially, he must show ability in providing for himself in life out-of-doors. Merit Badges are awarded for particular achievements in a wide range of subjects, such as photography, public health, aviation, agriculture, and many vocational activities. The ranks of Life Scout, Star Scout, and Eagle Scout are awarded for five, ten, and twenty-one Merit Badges, won in some required and elective subjects. Emphasis upon the Scout Oath and Law and length of service are also requirements. The department of Sea Scouting has developed a nautical program, designed especially for older boys, which is becoming increasingly popular.

Organization. Scouts are organized in Troops of not more than thirty-two boys, under a Scoutmaster, who must be an adult male citizen of the United States. Troops consist of four Patrols, each of not more than eight boys; each Patrol is in charge of an older boy, who is called Patrol Leader. Troops are organized in connection with some institution, such as a church, school, or club. A Troop Committee of three adult male citizens connected with the institution sponsors each Troop, guaranteeing leadership, a meeting-place, and so far as possible, an opportunity for the Scouts to go to camp in the summer.

The Scout movement is administered locally through local councils, composed of representatives of the institutions sponsoring Troops, and the educational, religious, and civic interests of the community. Each local council is represented on the National Council, which

meets annually, and is the corporation of the Boy Scouts of America.

The National Council of the organization works through an Executive Board; Daniel Carter Beard is National Scout Commissioner. Local councils organize and supervise the work in local communities. The Scout program, for it is less an organization than a plan or program, is adopted by many schools and churches as the form for their work for adolescent boys. Several colleges have established courses for Scout leaders.

Camping Activities. The great interest in camping and outdoor activities which has been noted in this country in recent years is due in no small measure to the leadership of the Boy Scouts of America. With the coöperation of

experts, the camping department has developed minimum requirements of health, safety, and sanitation that are the accepted standards for all camps. Special emphasis has been placed upon swimming, water safety, and life-saving, with the aim of teaching every Scout in camp to swim.

Camping is a year-around program, and short-term camps, troop camps, and winter camps are a feature of the Troop.

Camping activities include tree-planting, both on a large scale and in setting out memorial trees; trail building in national parks and elsewhere; exploration and adventure hikes in many hitherto unexplored sections of the country; patriotic pilgrimages to historical shrines; trek, automobile, and truck tours; pest control (harmful insects or other injurious animal and vegetable life); conservation; establishing and maintaining game sanctuaries and fish hatcheries; forestry projects of all kinds; fire-fighting; service to state and county fairs, and exhibition service and demonstration camps. There is almost no limit to proper activities.

Rural Scouting. The Scout program has been enriched by new material which is suited to the life of the boy on the farm as well as to the boy in the city. Alternative requirements for the Scout ranks, with a rural emphasis, have been added, and new agricultural Merit Badges.



FOUR LONE SCOUTS

Ready to start on a cross-country tour from New York to San Francisco, along the Lincoln Highway, to demonstrate highway safety.

THE SCOUT LAW

Between "Duty to God" and "Duty to Country."

1. "A SCOUT IS TRUSTWORTHY."

A scout's honor is to be trusted. If he were to violate his honor by telling a lie, or by cheating, or by not doing exactly a given task, when trusted on his honor, he may be directed to hand over his Scout badge.

2. "A SCOUT IS LOYAL."

He is loyal to all to whom loyalty is due, to his Scout leader, his home, and parents, and country.

3. "A SCOUT IS HELPFUL."

He must be prepared at any time to save life, help injured persons, and share the home duties. *He must do at least one good turn to somebody every day.*

Between "Duty to Country" and "Duty to Others."

4. "A SCOUT IS FRIENDLY."

He is a friend to all, and a brother to every other Scout.

5. "A SCOUT IS COURTEOUS."

He is polite to all, especially to women, children, old people, and the weak and helpless. *He must not take pay for being helpful or courteous.*

6. "A SCOUT IS KIND."

He is a friend to animals. He will not kill or hurt any living creature needlessly, but will strive to save and protect all harmless life.

Between "Duty to Others" and "Duty to Self."

7. "A SCOUT IS OBEDIENT."

He obeys his parents, Scoutmaster, patrol leader, and all other duly constituted authorities.

8. "A SCOUT IS CHEERFUL."

He smiles whenever he can. His obedience to orders is prompt and cheery. He never shirks nor grumbles at hardships.

9. "A SCOUT IS THRIFTY."

He does not wantonly destroy property. He works faithfully, wastes nothing, and makes the best use of his opportunities. He saves his money, so that he may pay his own way, be generous to those in need, and helpful to worthy objects. *He may work for pay, but must not receive tips for courtesies or good turns.*

Between "Duty to Self" and "Duty to God."

10. "A SCOUT IS BRAVE."

He has the courage to face danger in spite of fear, and to stand up for the right against the coaxings of friends or the jeers or threats of enemies, and defeat does not down him.

11. "A SCOUT IS CLEAN."

He keeps clean in body and thought, stands for clean speech, clean sport, clean habits, and he travels with a clean crowd.

12. "A SCOUT IS REVERENT."

He is reverent toward God. He is faithful in his religious duties, and he respects the convictions of others in matters of custom and religion.

The Lone Scout organization, which was founded by the same W. D. Boyce who brought the Scout movement to America in 1909, was merged with the Boy Scouts of America in 1924. The department of Rural Scouts of the National Council, Boy Scouts of America, was organized in 1927.

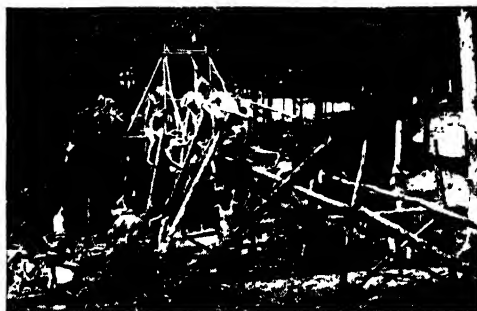
The purpose of the department of Rural Scouting is to make it possible for rural boys to receive the same Scout training as Boy Scouts in Troops. It offers a program of activities for the development of mind and

body, and inculcates in the boys daily habits of unselfish service and desirable principles of conduct, with emphasis on character-building and participating citizenship work.

In addition to this, the program teaches woodcraft, camping, and achievement in all forms of Scoutcraft work, and offers through the Merit Badge system a type of pre-vocational training, with the view to helping all Scouts to find their places in life's work and to make helpful contacts with successful men in these various crafts.

Rural Troops are organized in churches, schools, grange halls, community buildings, and the like, with a Rural Scoutmaster and a Troop Committee, as in city Troops. The rural program, as distinct from the city program, is applied to the farm Troop.

If there are not enough boys to form a Troop, they may organize a Farm or Home Patrol, with from four to seven boys. Such a Patrol



PIONFFRING

This is a part of the Boy Scout program. These members are building a rude but serviceable bridge

is not connected with an institution, and has no Troop Committee, but it has a Scoutmaster, who is endorsed by three parents of the Scouts. Later, two or more such rural Scout Patrols may associate themselves in a Troop.

The boy who cannot join a Troop or a Patrol may become a Lone Scout, and carry on the Scout program by correspondence.

Summary. The principle of "learning by doing" is made a reality in the Scout movement. The small khaki-clad boy who trudges past on his way to a Scout camping trip is playing a game, but one in which he learns useful knowledge and useful qualities; it employs competition, coöperation, and good sportsmanship; whether he realizes it now or not, he is working toward the aim and end of all scouting, which is good citizenship. He will "be prepared" to take his share of responsibility as a citizen of his country, and by the brotherhood of Scouting, which reaches through other countries, he will become as well a citizen of the world. E.S.M.

Related Subjects. In connection with the Boy Scout movement, the following articles in these volumes should be read

Baden-Powell	Camp Fire Girls
Beard, Daniel Carter	Girl Scouts
Seton, Ernest Thompson	

BOYS IN BLUE. See BLUE (Historical).

BOYS IN GRAY. See BLUE (Historical).

BOZZARIS, *bo tsah' rees*, MARCO (about 1790-1823), a noted patriot and hero in the Greek struggle for independence. He was born in Albania, of a family famous for its bravery. Through his skilful defense of Missolonghi, he gained especial renown. After many victories

over the Turks, he finally lost his life in a daring night attack upon the camp of the pasha of Scutari. In the poem *Marco Bozzaris*, Fitz-Greene Halleck has glowingly told the story of this last attack, and he ranks Bozzaris in history in these words:

One of the few, the immortal names
That were not born to die.

BRABANT, *brah bant'*, the central district of the lowlands of Holland and Belgium. The northern portion comprises the present Dutch province of North Brabant and the southern portion the Belgian provinces of Brabant and Antwerp. This district extends from the Waal to the sources of the Dyle, and from the Meuse and the plain of Limburg to the lower Scheldt. In the time of Caesar, Brabant was inhabited by a mixed race of Germans and Celts; in the fifth century, the Franks took possession of it.

During the centuries which followed, this region was at various times a part of the dominions of France and of Germany; in 1477 it passed to the Austrian House of the Hapsburgs, and so to the Emperor Charles V, becoming thereby the inheritance of his son, Philip II of Spain. The people of Northern Brabant joined the other Netherlands in their revolt against that cruel monarch, and their province became a part of the independent Dutch Republic.

At the close of the wars of Napoleon, when the kingdom of the Netherlands was established, all of Brabant was included in the realm, and it was divided into the provinces of North Brabant, South Brabant, and Antwerp. The two latter provinces became parts of Belgium in 1830, when that country declared its independence and separated from the kingdom of the Netherlands; South Brabant was known from that time as Brabant. The oldest son of the king of Belgium, heir apparent to the throne, bears the title, Duke of Brabant. See HAPSBURG, HOUSE OF.

BRACHIOPODA, *brak ih op' o dah*. See ZOOLOGY (Divisions of the Animal World)

BRACKEN. See BRAKE



BRACTS

a indicates location This form of cluster is called a raceme.

BRACT, *brakt*, a kind of small, modified leaf found on the stems of certain flowering

plants. Ordinarily, the flower stalk rises from the point where a leaf joins the stem, that is, from the leaf axil. If the flower is borne singly, it usually springs from the axil of a leaf of ordinary size, but when a number of flowers are borne in a cluster, the axillary leaves tend to become dwarfed and are then known as bracts. Some bracts simply have the appearance of tiny leaves, some are mere scales, and there are some that are hairlike. See **RACEME**. B.M.D.

BRADDOCK, EDWARD (1608-1755), a famous English general who led the British and the colonial troops in the disastrous expedition against Fort Duquesne, during the French and Indian War. Having been appointed commander of all the British forces in America in 1754, he planned as the first event of a campaign against the French the capture of Fort Duquesne, on the site of the present city of Pittsburgh. In 1755 he was joined by Virginia troops near Alexandria, and at Frederick, Md., he added to his staff George Washington and Benjamin Franklin.



Photo Brown Bros

EDWARD BRADDOCK

Scorning the advice of both these experienced colonials regarding the danger of exposing himself to the Indians, who were accustomed to fight from ambush, he set out from Fort Cumberland by the path marked out by Washington two years before. On July 9 the advance guard was attacked by a band of French and Indians. The British, frightened by the war whoop of the red men and confused by the Indian method of fighting from behind trees, were defeated. Braddock showed conspicuous personal bravery, but fell mortally wounded after five horses had been shot from under him. Washington led the survivors, less than half the force, to a place of safety. See **WASHINGTON, GEORGE** (Life on the Frontier).

BRADDOCK, PA. See **PENNSYLVANIA** (back of map).

BRADFORD, ENGLAND. See **ENGLAND** (The Cities).

BRADFORD, PA. See **PENNSYLVANIA** (back of map).

BRADFORD, WILLIAM (about 1590-1657), an American of the colonial period and second governor of Plymouth Colony, was born in Yorkshire, England. His work as a historian of the Massachusetts Pilgrims makes him the father of American history. He joined the

Separatists at Scrooby, and suffered imprisonment for trying to escape from England. Later, he succeeded in reaching the Pilgrims in Holland, whither many of them had removed to secure freedom of worship, and there he became a tradesman. In 1620 he sailed with them on the *Mayflower*, and became one of the founders of Plymouth Colony. Chosen governor of the colony in 1621 to succeed John Carver, he held that office until his death, except for five years when "by importunity he got off." Throughout this period his tact, good judgment, and high executive ability were important factors in making the colonizing experiment a success. See **PLYMOUTH COLONY** (The Honored 102).



Photo Brown Bros

WILLIAM BRADFORD

The authenticity of the picture is a subject of dispute. Some authorities declare that no portrait of this second governor of Plymouth is in existence, but the painting from which the above was photographed is declared by others to be the likeness of Bradford.

A Valuable Source Book. Bradford's historical work, *The History of Plymouth Plantation*, is a day-by-day account of the colony from 1631 to 1640, upon which all later histories of Plymouth have been based. The author left the work in manuscript. It found its way in the course of time into the archives of the Old South Church, Boston, but disappeared during the Revolution. In 1855 it was discovered in the Fulham Library, England, and was soon after sent to the United States. It was published two hundred fifty years after Bradford wrote it. It is one of the most valuable of all the original documents dealing with American history. The original work is now among the archives of Massachusetts.

BRADSTREET, ANNE (1612-1672), the first woman writer America produced, was the wife of Simon Bradstreet (1603-1607), who became governor of Massachusetts Colony in 1670. She was born in England, was a daughter of Thomas Dudley, the second colonial governor of Massachusetts, and came to America in 1630, two years after her marriage. There, in addition to bringing up a family of eight children, she found time to write poems that were the delight and admiration of her friends in the colony, who called her "The Tenth Muse." Her poetry consists, in general, of discourses on the universe, its history and its phenomena; to the modern reader, it seems to be nothing more than rhymed prose. Nevertheless, though she lacked the real poetic gift, she deserves a place in the history of American literature, for she devoted herself to literature

for its own sake, and was one of the first writers to do so. See AMERICAN LITERATURE.

BRADSTREET COMMERCIAL AGENCY. See COMMERCIAL AGENCY.

BRADY, CYRUS TOWNSEND (1861-1920), an American clergyman and author whose writings, though clean and wholesome, have in them little of a ministerial character. Born in Allegheny, Pa., Brady was graduated from the United States Naval Academy, and then went west in the service of a railroad. After studying theology, he became a rector of the Protestant Episcopal Church, and later was made archdeacon of Kansas. He was rector successively of churches in Philadelphia, Toledo, Kansas City, and Mount Vernon, N. Y. During the Spanish-American War, he served as chaplain in a Pennsylvania regiment.



Photo Brown Bros

CYRUS TOWNSEND BRADY

Brady's Books. *Under Fop's and Tents, Hohenzollern, In the Wasps' Nest, A Little Traitor to the South, The Love Test, The Island of Regeneration, The Fellers of Freedom,* and the *Bob Dasherway* series are for the most part tales of the masculine, warlike type; Brady cannot be accused, as are many clerical story-writers, of "helping in the great work of feminizing the world." His non-fictional books, including *lives of Decatur and Paul Jones, Border Fights and Fighters,* and *Sir Henry Morgan, Buccaneer,* are wholesome and yet full of thrills and adventure.

BRAGG, BRAXTON (1817-1876), an American soldier in the Confederate army during the War of Secession. He was born in North Carolina, was graduated at West Point in 1837, and in that year saw active service in the Seminole War. During the Mexican War, he rose to the rank of lieutenant colonel, but in 1856 resigned from the army and engaged in sugar-planting in Louisiana. When the War of Secession broke out, he was placed in command of Southern forces at Pensacola, Fla., with the rank of brigadier general, and in the following year was made major general. At the Battle of Shiloh he



Photo Brown Bros

BRAXTON BRAGG

became the commanding general on the death of A. S. Johnston, and later succeeded Beauregard in command of the Army of the West. His defeat at Perryville and at Murfreesboro brought upon him severe criticism in the South, but he regained his popularity by his defeat of Rosecrans at Chickamauga, in September, 1863. Defeated by Grant at Chattanooga, he became military adviser to Jefferson Davis, but resumed active service to conduct an unsuccessful expedition against Sherman in Georgia. After the close of the war, he was chief engineer of the state of Alabama. See WAR OF SECESSION.

BRAHE, brah, or brah' ay, TYCHO (1546-1601), a celebrated Danish astronomer, whose tireless study of the heavens added much to what was known in his day of the facts of astronomy. He studied philosophy and rhetoric at the University of Copenhagen, and entered the University of Leipzig as a law student, but was interested only in astronomy, which he regarded as "something divine." From 1571 until his death, he was able to devote the greater part of his time to his chosen field of labor.



TYCHO BRAHE

In 1572 he sighted a new star in the constellation Cassiopeia, and, after carefully studying its position, published an account of his observations.

Frederick II of Denmark became interested in his investigations, and in 1576 fitted up for him on the Island of Hveen, in the Sound between Denmark and Sweden, the magnificent observatory of Uraniborg, "the fortress of the heavens." There Brahe worked and studied for twenty years, testing and improving upon the theories of Copernicus, discovering new laws governing the motion of the moon, and throwing new light on the subject of comets. After the death of Frederick, Brahe suffered from opposition and persecution, and was obliged to leave Uraniborg. In 1599 he went to Prague, in Bohemia, where he was able to render valuable assistance to a young man destined to be a greater astronomer than himself, Johann Kepler (which see).

BRAHMA, brah' mah, the Supreme Being in the religion of the orthodox Hindus. He is conceived to be the creator of the world, which is to endure for 2,160,000,000 years and then be destroyed, to be recreated by him after the same number of years. He is called the Self-existing, the Great Father, the Lord of

Creatures, and the Ruler of the World, but he has little part in actual religious worship (see BRAHMANISM), and has never been worshipped by the common people. Only one temple sacred to him is known.

In Hindu mythology, Brahma is represented with four heads and four arms. Originally he had five heads, but it is said that one was destroyed by the god Siva. His color is red, and he rides upon the Swan, which is sacred to him. Sarasvati, the goddess of eloquence, is his consort. See BRAHMANISM.

BRAHMANAS, *brah' ma nahz*. See VEDAS.

BRAHMANISM, *brah' man iz'm*, OR **HINDUISM**, *hin' doo iz'm*, one of the great religions of the world, the faith of over 200,000,000 Hindus. It takes its name from the priestly class of India, known as the Brahmans, and from the Hindus, who are its devotees. Brahmanism is based on ancient religious writings called the Vedas, the sacred revelations of which are interpreted by the Brahmans. Unlike Christianity, Mohammedanism, and Buddhism, Brahmanism has no definite founder. The word *Brahma*, so importantly connected with this system, is used in two ways. In its neuter form, it refers to the Universal Power, the all-pervading essence of the universe, of which the human soul is a part; in its masculine form, it is the name of Brahma, the Supreme Being in Brahmanism.

Brahmanism is both a religious and a social system. As a religion, its chief doctrine is that all existence is bound up in sorrow and evil, and that the one way for the human soul to be saved is to become merged with the Universal Power, Brahma. In order to return to Brahma, the soul must be purified by meditation, self-control, and self-denial. Growing out of this belief is the doctrine of the rebirth of the soul. As only a few reach the state of perfection in a single lifetime, the great majority must be born again and again. Those who are righteous live again in a higher spiritual state, but those who die in sin pass to a lower condition, and their souls may even enter the bodies of unclean beasts.

Brahman Castes. Socially, Brahmanism is a system of castes, by which the Hindus are divided into distinct classes. According to an ancient tradition, Brahma created four castes—Brahmans, soldiers, laborers, and serfs. These sprang from his mouth, his arms, his thighs, and his feet. The changing conditions of the passing centuries have brought about a great modification of this system; at the present time, it is based largely on industrial conditions, with the members of every trade and occupation forming a separate caste. In the modern Hindu society, there are several hundred castes. The Brahman himself may now engage in commercial occupations and hold office. The priestly class represents the highest culture

of India, and as the result of centuries of education, they have produced a type of distinct superiority.

Stages toward Perfection. To attain the ideal state of perfection, the Brahman is supposed to pass through four stages. In the first, he begins to study the Vedas, where he learns all about the privileges of his caste; he is taught that he has a right to ask alms, and to be free from paying taxes, or from suffering capital punishment. He is not allowed to eat flesh and eggs, and must not touch leather or the skins of animals. Above all, he is taught to abhor sin, and he receives instruction in the rules and ceremonies prescribed for his purification.

The second stage of the Brahman begins with his marriage; he is then called upon to observe many new rules regarding fasting, washing, etc. When he has trained a son for the holy calling, and has seen the son of that son, he is ready for the third stage. The Brahman who attains to this stage retires to the forest, where he prays and meditates and studies the sacred Vedas. Bathing is practiced morning, noon, and night, and many severe penances are imposed. In the fourth stage, he inflicts still more cruel tortures upon himself, and in the end his soul is ready to become a part of the divine nature. The third and fourth stages are an ideal which is rarely attained.

The Triad. Brahmanism is an outgrowth of early nature worship, practiced in the period when the oldest hymns of the Vedas were being written. Brahma, the Supreme Creator, is the head of the Triad of three gods, the other two being Vishnu, the Preserver, and Siva, the Destroyer and Reproducer. The Triad is a later development in Hindu theology, and in modern religious practice Brahma has almost no part, for the worship of one Supreme Being is too abstract an idea to appeal to the Hindu intellect. The worship of Brahma has therefore given way to that of Vishnu and Siva. There is, however, a reform spiritual movement going on in India, in which God is worshiped under the form of Brahma in the three aspects of Creator, Preserver, and Destroyer.

Related Subjects. The reader is referred in these volumes to the following articles:

Brahma	Transmigration of the Soul
Caste	Vedas

BRAHMANY, *brah' man ie*. See ZEBU.

BRAHMAPUTRA, *brah mah poo' trah*, **RIVER**, one of the most important waterways of Southern Asia. It rises in Tibet, in the snowy slopes of the Himalaya Mountains, and after a course of nearly 1,800 miles, joins the waters of the sacred Ganges, with which it shares the great Ganges delta. In its northern reaches, the river receives various names; it is called Tsanpo, or the *pure one*, by the inhabitants of certain districts of Tibet.

For about 700 miles it follows a southeasterly direction, then takes a southwesterly course through the plains of Assam, and crosses to Bengal, where it joins the Ganges. At a height of 13,800 feet above sea level, the river is navigable, and it forms an important link in internal commerce. In certain parts, navigation is rendered impossible on account of narrow gorges and rapids, but large boats may ascend the river a distance of 800 miles from the sea.

The Brahmaputra retains the distinction of being unbridged throughout its length, communication across it being maintained entirely by boats and rafts. The principal tributaries, themselves mighty rivers, are the Lohit, Dibong, Dihong, and Subansiri, each receiving the drainage of a large area. The valley of the Brahmaputra is fertile and extensively cultivated; tea, rice, and jute are produced in immense quantities. In times of rain, the river floods many hundreds of square miles along its banks, a natural irrigation which is of great advantage to rice growers.

BRAHMS, *brahmz*, JOHANNES (1833-1897), the last of that famous line of German musical composers of first rank which began with Bach. Brahms was born at Hamburg, where his musical education was begun by his father. At the age of ten, he was sent to the best teacher in Hamburg, who was so impressed by the boy's talent that he prophesied he would win a greater name in music than did Mendelssohn. He early came in touch with the great musicians of his day, including the famous violinist, Joseph Joachim, and Liszt and Schumann. The last-named wrote enthusiastically in praise of the young musician, after he had heard Brahms play some of his own compositions. Brahms composed and played thereafter in several of the music centers of Germany and, in addition, held positions as music director and concert conductor. The later years of his life were spent mostly in Vienna, where his great masterpieces, appearing from year to year, won for him the highest honors of the music world.

Principal Compositions. The principal compositions of Brahms include four symphonies; two serenades; the *Tragic Overture*; the majestic *German Requiem*, a choral work suggested by the death of his mother, variations on one of Haydn's themes, known as the *Chorale Saint Antoine*; the Hungarian Dances

for the piano; trios, quartets, and quintets, several concertos; and nearly 200 songs, the best known of which is the beautiful *How Art Thou, My Queen?* Brahms was one of the most intellectual of the master composers, and though he is not yet fully understood, his fame continues to grow as the world is learning better to appreciate him.

BRAID, JAMES. See HYPNOTISM.

BRILLE, *brah' e* (in English, *brale*), **ALPHABET**. See BLINDNESS (Education of the Blind).

BRAIN, the organ of the body which controls all thought, action, and feeling, and is the center of the nervous system in man and the higher animals. An eminent authority has called it the "great central exchange of our telephone system." Nothing in the world is accomplished by man that is not first conceived in his brain. The steam engine first assumed shape in the mind of Watt; in the brain of Edison were built the electric light, the phonograph, and the moving-picture apparatus; the brain of Napoleon was so gigantic that it required nearly all of Europe to move it to Saint Helena that it might no longer demolish thrones and crumble empires.

The human brain is relatively larger than that of the lower animals. Intelligence, however, cannot be correlated with the size of a brain. It is dependent, rather, upon the relative development of the various parts of the brain, the cerebrum being the most important part from this standpoint. In lower animals, the cerebrum is relatively very small; in man, it is the most extensive part of the brain.

Structure. The brain fills all the cavity enclosed by the skull, commonly known as the *cranium*. There are two different methods of dividing it. According to one system, it has four parts: the *cerebrum*, or large brain; the *cerebellum*, or small brain; the *pons*, and the *medulla oblongata*, which forms the upper end of the spinal cord. It may also be divided into a *forebrain*, *midbrain*, and *hindbrain*. The forebrain is the cerebrum; and the hindbrain, the cerebellum, the pons, and the medulla. The midbrain is a short, compressed part which connects the fore- and hindbrains.

Gray and White Matter. Brain substance is of two kinds, gray matter and white matter. The gray matter, or *cortex*, is on the outside; it forms that portion of the brain which is the center of all mental and voluntary physical acts. It follows the folds, or convolutions, in a thin layer composed of minute cells, so small that they cannot be seen except by a powerful microscope. It is estimated that the gray matter of the cerebrum contains more than nine billion of these cells. The white matter is more compact, and it forms the greater portion of the brain. It is made up of nerve fibers, which convey the nerve impulses

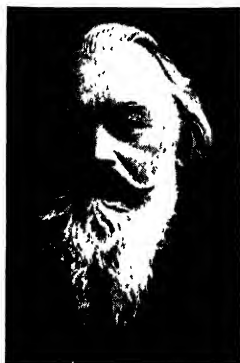
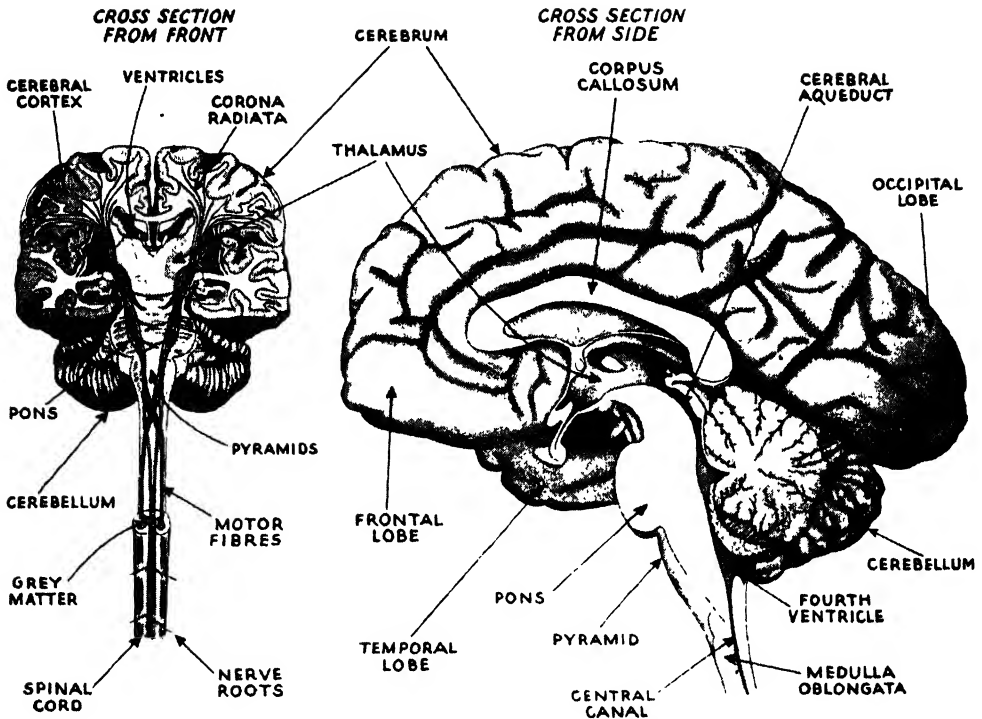


Photo Brown Bros.

JOHANNES BRAHMS



NAMES OF THE PARTS OF THE BRAIN

to and from the nerve cells in the cortex. The white matter in the brain is the last bit of road over which the nerve impulses must travel on their journey to the cortex. It is directly connected with the great fiber pathways of the spinal cord, which are in turn connected with nerves that lead to all parts of the body. Extending from the gray matter through the white to the various centers in the brain itself are numberless nerve fibers, which serve to connect these centers with each other.

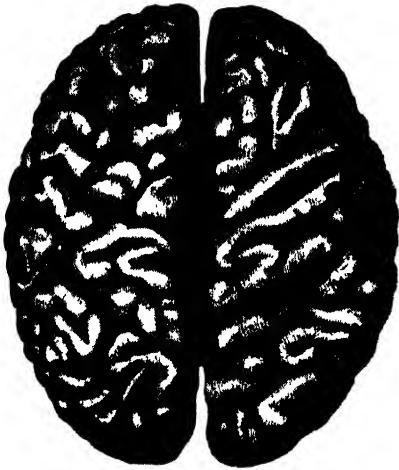
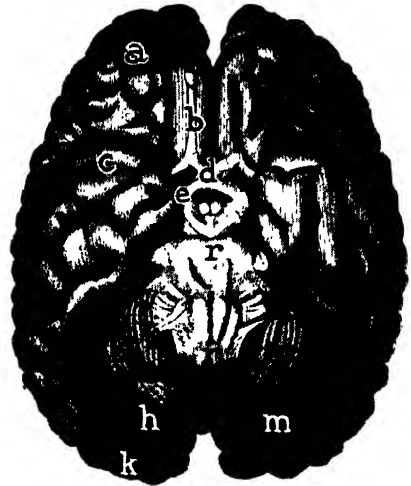
Membranes. The brain is surrounded by three protective membranes, called the *meninges*. The *dura mater* is strong and tough. It forms the lining of the skull, and also forms the partitions which separate the hemispheres of the cerebrum, and the cerebrum from the cerebellum. The *pia mater* is more delicate, and it lies next the brain. Between these is the *arachnoid* (spider's web), which is formed from the inner layer of the *dura mater* and the outer layer of the *pia mater*.

Cavities. Under the cerebrum, and almost in the center of the head, are two cavities known as *lateral ventricles*. They are separated by a thin membrane, and they connect with the third ventricle, which is just below them. Below the third, and almost in front of

the medulla oblongata, is the fourth ventricle, which connects with the canal in the spinal cord. A liquid known as the "spinal fluid" fills these cavities. Inflammation of the membranes may be detected by examination of these fluids.

The Cerebrum. The cerebrum occupies all the upper part of the cranium, and forms more than seven-eighths of the brain. It is divided into two equal parts, called *hemispheres*, by a deep fissure extending from front to back. In shape, each hemisphere closely resembles a very large coffee-bean. A band of *fibers* unites the hemispheres on their under side, and forms the roof of the lateral ventricles. Each hemisphere is divided into parts known as the *frontal*, the *parietal*, the *temporal*, and the *occipital* lobes, each named from the bone of the skull under which it lies. The brain substance contains many folds, or convolutions, which greatly increase the surface of the gray matter. It is estimated that the surface of the cerebrum is equal to that of the human trunk, but by means of these folds it is compacted into a small space.

The cerebrum is the controlling organ of the body, the seat of mental activities and voluntary action. It is divided into numerous centers, which control certain movements,

*Upper surface of cerebrum**The base of the brain*

TWO EXTERIOR VIEWS OF THE BRAIN

- (a) Anterior lobe of the cerebrum
- (b) Olfactory nerve
- (c) Portion of posterior lobe
- (d) Optic chiasm
- (e) Optic tract

- (h-m) Hemispheres of the cerebellum
- (k) Occipital lobe
- (n) Medulla oblongata
- (r) Pons Varoli

or functions, such as sight, hearing, taste touch, and smell. Injury to one of these centers results in the loss of the function over which it presides. If the visual centers are injured, blindness follows; if the auditory centers are affected, one becomes deaf. Paralysis of any part of the body is usually caused by the formation of a blood clot over the brain center controlling the motor nerves that extend to that part of the body. While many centers have been located, there are many more whose locations are not yet known.

The Cerebellum. The cerebellum is situated in the back of the head, below the cerebrum. It is partially divided into hemispheres, and each hemisphere is connected with the cerebrum by three sets of nerve fibers. The gray and white matter intermingle in the cerebellum more fully than in the cerebrum. The white matter consists of nerve fibers which unite into a system of nerves that extend through the spinal cord to all parts of the body. The chief function of the cerebellum seems to be to harmonize those muscular movements necessary to maintain the body in an upright position when standing, walking, or running. If this part of the brain is injured, one staggers.

The Pons Varolii. The pons is a passageway for nerves from various parts of the nervous system. It seems to be used chiefly as a means of communication, but it is supposed to be the seat of other functions not yet understood.

The Medulla Oblongata. We have already remarked that the medulla, at the base of the

brain, is really a part of the spinal cord. The nerve fibers passing from the brain to the spinal cord have all crossed to the opposite side by the time they have reached the medulla, so that the nerve centers in the brain control the movements on the opposite side of the body; paralysis of the motor nerves in the right side of the brain results in paralysis of the left side of the body. The motor centers of the right hemisphere of the cerebrum control the movements of the left hand and leg, and those of the left hemisphere control the movements of the right arm and leg.

The first function of the medulla is to transmit the nerve impulse to and from the brain. Its second function is reflex action, that is, sending a motor impulse to any part of the body, before the sensation resulting in that impulse reaches the brain. The third function of the medulla is to preside over those movements necessary to the maintenance of life which are carried on without the action of the will, such as respiration, circulation, and digestion. Because of this function, the medulla is sometimes called the "vital knot"; literature offers frequent references to this term.

Health of the Brain. The brain, like the muscles, is strengthened by use and is fatigued by over-exertion. Sleep is merely a resting time of the brain and nerves, and plenty of sleep is essential to a healthful nervous system. Fresh air, nourishing food, and bodily exercise are also necessary to clear thinking and vigorous mental action, which can come only from a healthy brain. Narcotics, alcoholic beverages,

and drugs all work more or less injury to the brain, and they should be avoided. K.A.E.

Related Subjects. In connection with this article, the following topics will be found interesting and helpful:

Aphasia	Meningitis	Reflex Action
Apoplexy	Nerves	Spinal Cord
Epilepsy	Nervous System	Subconscious

BRAINERD, MINN. See MINNESOTA (back of map).

BRAKE, OR BRACKEN, a species of fern very common in North America, Europe, and Asia, often covering large areas of hillside and untilled ground. It has a black, creeping rootstock, from which slender stalks grow. These divide into three branches at the top, and sometimes grow to be several feet tall. As the plants do not fall when the frost kills the tops, they form a good cover for small game



Or have you mark'd a partridge quake.
Viewing the towering falcon nigh?
She cuddles low behind the brake
Nor would she stay, nor dares she fly

—PRIOR. *The Dove*.

throughout the year. The rootstock is bitter, but has been eaten in times of famine. It has also been used in place of hops in beer-making. In the dressing of chamois and kid leather, it is still occasionally employed. The word also means a tangled undergrowth. G.M.S.

Scientific Name. The brake described above is classed as *Pteris aquilina*, in the family *Polypodiaceae*.

BRAMANTE, bra mahn' tay, DONATO (1444-1514), one of the greatest Italian architects of the period known as the Renaissance. During

the first twenty-eight years of his career, beginning in 1472, he worked in Milan, his masterpiece in that city being the choir and dome of the Church of Santa Maria delle Grazie. In 1499 he went to Rome, where he was so profoundly impressed by the splendid examples of Roman architecture that he



Photo Brown Bros.
BRAMANTE

adopted a new style in his art, and became thereby the founder and leader of the Middle Renaissance school of architecture. Not only did his work show his appreciation of beauty, but it also showed a thorough understanding of the laws of perspective and of engineering principles. Pope Julius II commissioned him to design new galleries for the Vatican, and then to plan the architectural achievement of the Renaissance, the rebuilding of Saint Peter's Church. His death in 1514 interrupted this great work, and his plans were considerably altered by his successors, including Raphael and Michelangelo. The drawings that he made for the reconstruction of the famous church were studied by later architects. See SAINT PETER'S CHURCH.

BRAMBLE, the name commonly given to various species of the rose family, whose prickly stems form tangled thickets along fences and on hillsides. Wild dewberry and raspberry shrubs are good examples of brambles. B.M.D.

Says the English poet Elliott, in the poem *To the Bramble Flower*:

Thy fruit full well the schoolboy knows
Wild bramble of the brake!
So, put thou forth thy small white rose
I love it for his sake

BRAN, the coarse outer coat of wheat, rye, and other cereal grains, which, by sifting, is separated from the flour in the process of milling. Ordinarily, when bran is referred to without any qualifying word, wheat bran is meant; the other brans are spoken of as rye bran, corn bran, etc.

Bran is an excellent food for all kinds of farm animals, and when mixed with corn meal, is especially prized by the dairy farmer, because of its milk-producing qualities. The other cereal brans are also used in feeding stock, but less extensively than wheat bran, because smaller amounts are obtained from the other cereal grains.

Carbohydrate in the form of cellulose is the most abundant constituent of bran. It is

also rich in phosphorus, and contains considerable protein. Its high percentage of cellulose makes it more valuable as roughage than as a nutritive food for human beings; there are various bran preparations on the market whose popularity is due to their laxative effects. While many bran breakfast-foods and bran-flour bread and muffins are palatable and useful in counteracting constipation, it is unwise to eat any kind of roughage in excess because of its tendency to irritate the intestine. Coarse food also tends to close the exit from the stomach; therefore, bran may be actually harmful for a person suffering from poor digestion.

E.V.M'C.

BRANCH, in the sciences. See CLASSIFICATION.

BRANCH HERRING. See ALEWIFE.

BRANDEIS, *bran'dees*, LOUIS DEMBITZ (1856-), an American lawyer and publicist, a conspicuous figure in the struggle for economic, social, and political justice, and since 1916, an Associate Justice of the United States Supreme Court. He was born in Louisville, Ky., but after his graduation from the Harvard Law School in 1877, he made Boston his home. He began the practice of his profession in 1879, and in a few years became one of the leaders of the local bar. His advanced political and sociological tendencies, however, grew with his practice, and eventually cost him many powerful clients, who discouraged his activities against "vested interests." Socially, he was later made unwelcome in many homes which at first were open to him. But no ostracism, social or otherwise, served to turn him from the course he charted for himself.



Photo U & U

LOUIS D. BRANDEIS

He was one of the earliest advocates of conservation, and in 1910 was legal adviser of Glavis in the Ballinger-Pinchot controversy [see ALASKA (History)]. In the same year, he appeared before the Interstate Commerce Commission as counsel for several associations of shippers, and made the startling claim that the railways of the United States were wasting \$1,000,000 a day by retaining methods in management which up-to-date manufacturers had discarded long ago in favor of more scientific systems. Railroad managers vigorously denied such a possibility, but began to effect economies that seemed, in part, at least, to justify the charge.

He frequently appeared in trials and public hearings involving such subjects of reform as a minimum wage and shorter hours for working women and children, and in 1910 he was chairman of the arbitration board which settled the strike of the New York garment workers. For many years a bitter critic of the New York, New Haven & Hartford Railway, he foretold the difficulties which beset that company in 1912 and 1913, long before the general public had any warning of disaster. His appointment in January, 1916, to membership in the Supreme Court was contested for nearly five months before confirmation was won in the Senate. See SUPREME COURT OF THE UNITED STATES; ZIONISM.

BRANDENBURG, the central province of Prussia, which was the greatest kingdom of the former German Empire, and is now the leading state of the republic of Germany. It has Berlin as its capital, and that city is the capital of the new republic. Brandenburg covers an area of 15,072 square miles. The surface is flat and well watered, and the industries and resources of the province are most highly developed. Internal communications by road, railway, river, and canal are excellent; the railroads are owned by the state. Agricultural pursuits have suffered during recent years owing to the inclination of rural inhabitants to move to the cities. The principal crops are barley, rye, potatoes, tobacco, hemp, flax, hops, and sugar beets. Cattle raising also gives employment to a large number of people.

As a manufacturing center, the province is of the greatest importance. Wool, silk, linen, paper, and leather goods form the bulk of the products, and there are numerous breweries and



BRANDENBURG

In the heart of Prussia, with Berlin as its center

distilleries. The principal towns, next to the capital, are Potsdam, Königsberg, Brandenburg, and Frankfort-on-the-Oder [see GERMANY (Principal Cities)]. The famous Brandenburg Gate, described in the article BERLIN, is

named after the province. Brandenburg's industrial life suffered severely during the World War; situated near the center of Germany and containing the capital city, it was keenly alive to every phase of the tremendous conflict. Population, 1925, exclusive of Berlin, about 2,588,688 (see PRUSSIA).

BRANDENBURG GATE. See BERLIN (Famous Buildings and Monuments).

BRANDES, *brahn' des*, GEORG MORRIS COHEN (1842-1927), the greatest Danish literary critic of his generation, and one of the greatest of modern times. He was born in Copenhagen, of Jewish parents, and was educated at the University in that city. After extensive travel in Europe, he taught for five years in the University of Copenhagen, and then removed to Berlin. After 1882 he made his home in his native city, and devoted himself to study and lecturing. In 1914 he visited the chief cities of the United States, everywhere arousing keen interest by his lectures and his personality.



GEORG BRANDES

Brandes brought new life to Danish letters, and became a stimulating critic of the world's literature. To him, literature itself developed into a "criticism of life," and his viewpoint became that of a philosopher--a disciple of the French critic Taine, and of John Stuart Mill and Herbert Spencer.

What Brandes Wrote. In his greatest work, *Main Literary Currents of the Nineteenth Century*, he discussed clearly the chief tendencies of the literatures of the European nations since 1800. He also wrote *Eminent Authors of the Nineteenth Century*, *Poland, Men and Works in European Literature*, and *Recollections of My Childhood and My Youth*.

BRANDING. See TATTOOING

BRANDON, MAN., a city well situated at an altitude of 1,180 feet, overlooking the Assiniboine River, 133 miles west of Winnipeg. Founded in 1881, its population in 1926 was 16,442.

Education. The city is an educational center. It has Brandon College, affiliated with McMaster University at Toronto, the provincial normal school, an Indian industrial school, and a ladies' college.

Railroads. Brandon is a division point on the Canadian Pacific and Canadian National systems, and the Great Northern Railroad reaches the city from the United States.

Industry. Nearly all the agricultural-implement-makers of the United States have branches here

There are large grain elevators and flour mills, besides over fifty factories that make a wide variety of products.

BRANDY, the name generally applied to the liquor obtained by distilling the fermented juice of the grape. If no qualifying word is used, it is understood that the grape is the basis of the brandy. When other fruits are employed, the liquor is known as apple brandy, cherry brandy, etc., according to the fruit used. All of these brandies contain about fifty per cent of alcohol; they differ from each other only in the essential oil which gives to each its particular flavor and aroma.

Brandy is clear and colorless when distilled, and it retains these characteristics if kept in glass vessels. Placed in wooden casks, it takes on the color of pale amber, for the coloring matter in the wood is dissolved out by the spirit. It is then sold under the trade name of *pale brandy*. Some dealers darken the liquor by means of caramel, and sell it as *brown brandy*. The flavor of brandy improves with age, but its strength declines. See ALCOHOL.

BRANDYWINE, BATTLE OF See REVOLUTIONARY WAR.

BRANDYWINE RIVER. See DELAWARE (The Land and Rivers).

BRANGWYN, *brang' win*, FRANK (1867-), one of the foremost of modern English painters and etchers. Brangwyn was born at Bruges, Belgium, where his father, a Welshman, was a manufacturer of church embroideries and vestments. One of his early teachers was William Morris, whose ideal in art was Gothic, but in Brangwyn's mature work the predominating characteristic is not Gothic purity, but an Oriental magnificence of color. His paintings have the decorative quality which is associated with the works of Morris and Rossetti and their friends, but this quality is obtained by emphasizing color and mass.

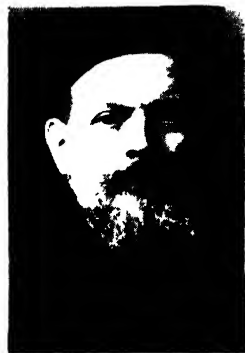


Photo U & I

FRANK BRANGWYN

Similarly, in his etchings he obtains brilliant contrasts in lights and shadows by treating his subjects as masses rather than as lines. This effect naturally involves the neglect or suppression of architectural and other details, but the loss of detail is more than balanced by the universal character which is given to the design.

Representative Works. All of Brangwyn's work is vigorous and dignified, and he is notably successful in

handling large paintings or etchings. His mural paintings include *Modern Commerce*, in the Royal Exchange, London; *King John Signing the Magna Charta*, in the courthouse at Cleveland, Ohio; and a series of four paintings for the Panama-Pacific Exposition at San Francisco. *The Convict Ship, Trade on the Beach, Saint Simon Stylites*, and *Venetian Funeral* are among his best paintings. His etchings include *The Sawyers* and *The Paper Mill*.

BRANT, JOSEPH (about 1742-1807), a brave and diplomatic Mohawk Indian chief, devoted to the welfare of his people. Brant was the name of his foster-father, his Indian name being THAYENDANEGA. At the age of thirteen, he took part with his two elder brothers in Johnson's campaign against the French at Lake George. He was sent to the Rev. Eleazar Wheelock's Indian school at Lebanon, Conn., from which Dartmouth College grew, became interpreter to a missionary, and taught religion to the Mohawks. During the Revolutionary War, the Mohawks adhered to the British, and because of his ability, Brant soon attained the rank of colonel. He fought in the Battle of Oriskany, one of the bloodiest engagements of the war, and led the Indians in many raids, but he was not present at the Wyoming Valley Massacre. Later, he lived in Canada on an estate granted him by the British government, and a bronze statue has been erected at Brantford, Ont., in his honor.



THE BRANTFORD STATUE

BRANTFORD, ONT., the county town of Brant County, sixth city in size in the province. It was settled in 1823, and named for the famous Mohawk Indian chief, Joseph Brant, in whose memory the city in 1887 erected a fine statue. Population, 1921, 29,440.

Railroads. The Canadian Pacific, the Canadian National, and the Toronto, Hamilton & Buffalo railroads enter the city.

Industries. Brantford lies within the zone of the Ontario hydroelectric development, a fact which adds to its advantages as a manufacturing city. There are more than seventy-five factories; agricultural implements, engines, and electrical supplies are among the leading articles made here.

BRANT GOOSE, also called BRENT GOOSE, a high-flying, sea-loving bird of the northern hemisphere, about twenty-six inches in length. It nests within the Arctic Circle, and migrates in winter as far south as the Carolinas. Al-

though at home especially on the Atlantic shores of Canada and the United States, it is occasionally seen inland. The male is distinguished by its blackish head, throat, and shoulders, brownish-gray back, and white patches on the sides of the neck. A related species, the *black brant*, is found in the western part of the continent. These wild geese feed on vegetable matter, and their flesh is savory and tender; hence they are popular game birds. D.L.

Scientific Names. The brant goose belongs to the family *Anatidae*. The common brant goose is *Branta bernicla gauloegastra*; the black brant is *B. nigricans*.

BRAS D' OR, brah dohr', LAKE, a tideless salt-water lake, or lagoon, which divides Cape Breton Island, N. S., nearly into two parts. This division is actually made by a ship canal which connects the southern end of the lake with Saint Peter's Bay, on the southwest coast. The entrance to the lake, which is on the northeast side of the island, is through two long channels, separated by Boulardeire Island. The south channel, which is twenty-two miles long and about a mile wide, has an average depth of 350 feet, and is the one navigated by large vessels. The waters swarm with salt-water fish, and the fisheries are of importance.

Derivation. *Bras d'Or* means *arm of gold*, in French, but it is supposed that the word is really of Indian origin, and was corrupted by the early French colonists to its present form.

BRASS, a bright-yellow or reddish alloy, produced by melting copper and zinc together, usually in the proportion of two parts of copper to one part of zinc. Brass is harder and stronger than either metal from which it is made, a condition true of any alloy. It can be cast in molds, rolled into thin sheets, and drawn into fine wire, and it takes a high polish.

Brass is mentioned in the Old Testament and other ancient writings, but bronze is probably the metal referred to. The "sounding brass" of Paul's famous passage in *First Corinthians* is what we know as bronze to-day. The Romans, however, had a compound which was nearly the same as our brass.

Varieties. Different varieties of brass are made by varying the proportions of copper and zinc. *Red brass* contains four parts of copper and one part zinc; *yellow brass*, the variety most often seen, is two parts copper and one part zinc. *Muntz metal* is three parts copper to two parts zinc; what is known as *speller solder* is one part copper to one part zinc, with a little silver added when intended for soldering articles of gold and silver. Brass intended for engraving purposes contains a little tin, and that to be turned or filed contains a small portion of lead, which makes it harder than the ordinary variety.

Uses. We are familiar with brass buttons, brass wire, brass beds, and numerous other

articles made from this metal, but we probably know little of the large quantities of brass wire, woven into screening and used for numerous other purposes, for its color is less characteristic. Another extensive use of brass is found in the manufacture of gas fixtures and electric lights.

Some varieties bear such a close resemblance to gold that they are mistaken for it by those unacquainted with the two metals. These varieties are employed in making watch cases, cheap jewelry, and other ornaments, which are sometimes priced above their real value.

Manufacture. The manufacture of brass and of articles made from it requires skilled workmen. The most common method of manufacture is by heating carbonate of zinc, charcoal, and thin pieces of copper in crucibles. The molten metal is then cast into bars or

ingots, which are again melted and recast to purify the metal.

Brass castings are made by pouring the molten brass into molds of sand, in much the same manner as iron castings are produced. Sheet brass is made by rolling the refined ingots in mills especially designed for that purpose, and brass wire is made in the same manner as other wire. The most extensive brass works in the world are in the Naugatuck Valley of Connecticut.

T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles

Alloy
Bronze

Copper
Wire

BRATISLAVA, *brah' tih slah vah*, in English, **PRESSBURG**. See **CZECHOSLOVAKIA** (Principal Cities).



BRAZIL, *brazil'*, UNITED STATES OF, in area one of the greatest republics in the world, comprising almost half of the continent of South America, and one of the most rapidly developing nations, though it contains more unexplored land than does any other country of the world. It is three hundred times the size of Belgium, is almost as large as Canada or Europe, including European Russia, and larger than the United States and its island possessions, exclusive of Alaska. Of the other twelve countries of South America, all but Ecuador and Chile touch Brazil on the north, west, or south; it is bordered on the northeast, east, and southeast by the Atlantic Ocean. Its greatest extent north and south approximately equals that from east to west, the former being 2,660 miles, the latter 2,700 miles, while the total area is 3,285,318 square miles.

Brazil has important trade and excellent steamship connections with the principal American and European ports. Rio de Janeiro, the capital, is 5,204 (nautical) miles from London, and 4,748 miles from New York; Para, on the northern coast, is 4,153 miles from London, and 2,915 miles from New York; it is 4,144 miles from Pernambuco, the easternmost port of Brazil, to London, and 3,678 miles to New York.

The People and Their Cities. While the

people of all the other countries of South America are of Spanish origin, Brazil was first peopled by the Portuguese; and the Portuguese language is the official language of the republic. The Brazilians, like the Portuguese, are poetically designated as *Lusitanians* (from the ancient Latin designation of their ancestors)

[The country was named from the brazil-wood, chips of which, falling from the woodman's ax, seemed like coals of fire to the first explorers. *Brazil* is a modification of the old English word *brazier*, meaning a metal basket of coals for heating rooms. The interchange of *l* and *r* is not uncommon in such words.]

Of the population of about 39,000,000, fewer than one-half are whites of unmixed blood, and one-third are of mixed blood. The remainder are negroes and Indians, many of the latter being little influenced by civilization. The negroes of Pernambuco played so remarkable a part in the early history of Brazil that they are given respect seldom accorded to their race in other lands. In the seventeenth century, they lived under a republican form of government. There has never been a large number of British or American residents in Brazil. A large majority of the white population are of Portuguese descent, but there has been much Italian, German, and Russian immigration within recent years, and now there are in the south large colonies of these nationals.

The population is densest in the coast region. Brazilian women of the upper class are very carefully trained in the proprieties of deportment, and to some their *duêñas* (chaperons) seem to be over-strict.

The Cities. There are a dozen cities each with more than 50,000 people. Most of these are on or near the coast; only one, Manaus, is far inland, on the Amazon River. The names of but few of the towns are familiar to North Americans.



BRAZIL
The proportion of the South American continent occupied by this vast country.

Bahia, *bah e' ah*, officially, in Portuguese, San Salvador de la Bahia de Todos os Santos, is the third city in size (after Rio de Janeiro and São Paulo), and the oldest city in Brazil, Amerigo Vespucci was here in 1503. Bahia is an Atlantic port, on the Bay of All Saints, and is about 800 miles northeast of the capital city. The business section is on the bay, the residence part being finely located on high hills inland, so steep that it is difficult to climb them, hydraulic elevators and sedan chairs carried by servants are employed for transportation up the inclines. Educational institutions are of excellent type, and include a university and medical college. Bahia is the seat of an archbishop, who is primate of Brazil, and the cathedral is the finest in the republic. The city has large cotton factories, and it exports sugar, rubber, cotton, coffee, hides, dyewoods, and tobacco. Population, about 300,000. It was the old colonial capital.

Fortaleza, *fawr ta la' zah*, or **CEARA**, in Portuguese, is the capital of the state of Ceara, on a bay at the mouth of a river of the same name, northwest of Pernambuco, around a bend of the Atlantic. The surrounding country is not highly productive, but the city is the outlet for the fertile interior. There is active trade in rubber, cotton, sugar, and coffee. It was first settled in 1611. Population, over 80,000.

Maceio, *mah sa yoh'*, capital of the state of Alagoas, on the Atlantic Ocean, southwest of Pernambuco, has manufactures of cotton goods and machinery, a shipyard, and growing sea-borne commerce. Cotton and hides are exported. Population, about 78,000.

Manaus, *ma nah' osch*, capital of the state of Amazonas, the most important inland city, a thousand miles up the Amazon River, but actually on the Rio Negro, ten miles from its junction with the great river. It is in all respects a modern city. Even though far from the sea, ocean liners penetrate to it. There is a very large trade in the products of the vast Amazon forests. The city has cable connection with Para, on the coast. Population, about 80,000.

Niteroy, *nik te roy'*, capital of the state of Rio de Janeiro, is on the Atlantic Ocean, and is separated

from the nation's capital city by the beautiful Bay of Rio de Janeiro. Many wealthy people live in its suburbs. Population, 90,000.

Para, *pa rah'*, or **BELEM**, in Portuguese, capital of the state of the same name, is $1\frac{1}{2}^{\circ}$ south of the equator and eighty-five miles from the ocean, on the Para, or Tocantins, River. Across the river to the west is the great island of Marajo, or Joannes, at the mouth of the Amazon. The city was founded in 1616; the old section is not attractive, but the newer part is wholly modern; there is a wealth of tropical vegetation. The city is the nearest steamship point to London and New York from Brazil, and it exports rubber, Brazil nuts, and cacao. Population, nearly 250,000.

Porto Alegre, *pawr' loh ah la' gr*, capital of the state of Rio Grande do Sul, near the southern end of the country, not far east of the Uruguayan boundary. It is one of the most substantial cities in Brazil, and is the outlet for the export of animal products from the interior. Educational facilities are unusually good. Coal is mined near the city. Population, about 185,000.

Pernambuco, or **RECIFE**, in Portuguese, capital of the state of the same name, occupies the easternmost point on the South American continent, about midway along the vast coast line between Rio de Janeiro and Para. The oldest part of the town is Recife proper, founded in 1504, a second section is built on an island and contains most of the public buildings, a third is the fine residential section, called Boa Vista, built on the mainland. No cities in Brazil have better educational facilities, and few are more attractive. The city is a port of call for all steamships plying in that part of the world. The principal exports are cotton, coffee, sugar, skins, and cacao. Population, about 250,000.

Rio de Janeiro, the capital of the republic, and one of the great world cities, is described in its alphabetical place in these volumes.

Santos, *sahn' tosh*, the port of São Paulo (see below), is on the Atlantic Ocean, just below the Tropic of Capricorn and slightly southwest of Rio de Janeiro. It is a handsome, modern city, with a harbor adequate to all possible demands. Because of the immense coffee interests inland, it is the greatest coffee-shipping port in the world, and this makes it the most important port in the country. Population, about 75,000.

São Paulo, *sou.V pou' loo*, capital of the state of the same name, is the second city in size in the republic. It is located 210 miles southwest of the capital city and twenty-five miles inland from its port, Santos (see above). It is a modern city, and is growing very rapidly, largely because it is the outlet of the most productive coffee district of Brazil, and because it is the center of large immigration from Europe, particularly from Germany and Italy. One of the world's greatest law schools is located here, and it is the center of the state railroad system. The state has a population of nearly 5,000,000, the city's population is more than 600,000.

Education and Religion. There is no compulsory education law covering Brazil as a whole, but school attendance is compulsory in a few of the states. The illiteracy percentage, counting the entire central population, is 74.6; but the more thickly populated coast states are far in advance of the in-



Photo U & U

A SCENE OF BEAUTY IN SAO PAULO

Illumination of a public square in which is located the Municipal Theater. The coffee industry of the interior has made this city one of the most prosperous centers of the country.

terior educationally, for they have secondary and technical schools, while the large cities possess libraries, museums, and professional schools. Each large city has its university, but these schools are below the standard of American universities.

Theoretically, freedom of worship prevails in Brazil, but there seems little need for such legal regulation, since over ninety-nine per cent of the population are Roman Catholics. Protestant churches have freedom of action, and Jews, Mohammedans, and Buddhists have established their beliefs here.

Highlands and Lowlands. The two great regions into which Brazil is divided according to its surface features are sharply distinguished. To the south and east lies the vast table-land known as the Brazilian Highlands, which geologists consider the first part of the continent to have been lifted above the sea. Everywhere this is in the neighborhood of 2,000 feet above sea level, and through much of its extent, 4,000 feet. Little rivers carrying the drainage of this plateau region to the great river systems have cut gorges in the surface, and at intervals mountain ranges rise, though they nowhere attain great height. Most important of these mountain systems is the Serra do Mar, or Sea Mountains, which border the southeastern coast, leaving but a narrow plain between mountains and sea. The highest peak in these mountains is Itatiaya (8,000 feet), west

of Rio de Janeiro. The spot where Rio stands was ages ago in the midst of a mountain range which has been drowned or washed over by the sea, this is shown by the wonderful harbor of Rio, with its steep, clear-cut sides and nearly 300 islands. Parallel with the Sea Mountains run lesser ranges.

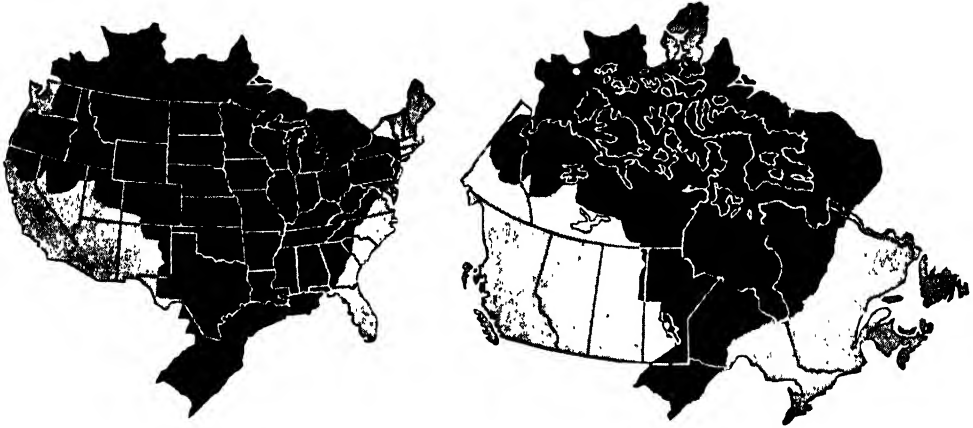
To the north and west of this plateau is the vast Amazon River basin, which forms the lowland portion of Brazil, and with the valleys of the great river's tributaries comprises over half of the country. This great plain, much of which is flooded each year, is for the most part less than 500 feet above sea level. It is in this basin that there still exists the largest unexplored area on the western hemisphere (see subhead *The Great Forests*, below).

The Amazonian lowland is bordered on the north by a plateau, less important than the southern table-land, which forms a natural line between Brazil, the Guianas, and Venezuela.

Rivers and Transportation. Brazil has not only the greatest river system of the world, that of the Amazon, which drains two-thirds of the country, but it has also several other large rivers. Chief of these are the Paraguay and Paraná, together draining one-fourth of the country, and the São Francisco, which is the waterway for the eastern plateau region. This last-named river, together with several of the streams which enter the Amazon in

its lower course, have sharp falls at the edge of the plateau, and are thus practically useless for navigation, but, as a whole, the Amazon system affords a navigable waterway which only the Mississippi-Missouri system can approach in length, though not in volume

Climate. Save for three small states in the extreme south, Brazil lies entirely within the tropics, with comparatively even climate. In the Amazon valley, the hottest part of the country, the average temperature is about 90°, but in the higher, dryer regions there is a some-



COMPARING THE AREAS OF BRAZIL, THE UNITED STATES, AND CANADA

of water poured into the sea. Of the 19,000 miles of the Amazon system which lie within Brazil, over 13,000 miles are navigable. The importance of this is hard to overestimate, for throughout much of their course these rivers flow through a valuable forest area, and are the only means of transportation. At the best, in a region of so vast a size, river travel is unsatisfactory, because the up-stream voyage must be very slow; weeks of journeying by canoe along the Amazon scarcely equals a day's travel by rail; but the time is far distant when roads or even trails will be opened up through the forests.

The river systems of Brazil received renewed attention in 1914, when Theodore Roosevelt, during his exploration of the wild central portion of the country, announced the discovery of a new river—a tributary of the Madeira, almost 1,000 miles in length. A chorus of skeptical comment arose at once—there could be no such river; the "River of Doubt" it was called in the press. The government of Brazil, however, sent out explorers to the region, with the result that Roosevelt's findings were confirmed, and a new river, the Rio Teodoro (Theodore), was placed on official maps.

All of Brazil is not dependent upon the rivers for travel, however, as the more open parts of the country have well-developed railroad systems. There are more than 20,000 miles of railway in operation, and several thousands more are planned. Of the present mileage, the Federal and state governments own three-fourths; the remainder is privately owned.

what greater range; in some large areas, it is not only healthful, but delightful. There are, as in most tropic countries, a wet season and a dry season, but these are not very well marked. Most of the rain falls between January and June, while from June to October the weather is comparatively clear and dry.

In general, Brazil has a very heavy rainfall, only a small region in the interior of the highlands having too little moisture for successful agriculture. The eastern plateau is well watered, but by far the heaviest rainfall is in the Amazon basin. Near the coast, the annual precipitation is from seventy-five to 100 inches, but inland, in the dense forest region, it is estimated it must be from 300 to 400 inches.

Throughout much of the river country, white men find it difficult to live, for the heat and the excessive moisture are fever-breeding, and distances are so great that a man in the far interior who is seriously stricken with disease has small chance of getting to a more healthful locality to receive medical treatment.

The Great Forests and the Rubber Industry. There has always hung about the forests of the Amazon a haze of romance, largely because they are so little known, and might, therefore, contain almost anything. Along the Amazon itself, and its chief tributaries, people have traveled for generations, but away from these water highways few adventurers have been daring enough to journey; aeronauts, even, have not ventured far from beaten paths.

Great trees of many species, among which palms are prominent, grow to heights of from



HOW THE COFFEE BERRY GROWS

Photo U & U

In the state of São Paulo alone, about 3,500,000 acres are devoted to coffee-growing. In the entire country, two-thirds of the world's coffee trees are found

sixty to fully 100 feet, and from their trunks and branches hang tropic vines, with stems as big as a man's arm. Heavy underbrush rises to meet these overhanging vines, and so makes a growth that is practically impassable. The enterprising traveler may cut a trail, but in an amazingly short time it is again overgrown with luxuriant vegetation, and all traces of it are washed away by the pouring rains.

In the forest, there are monkeys of many kinds, sloths, opossums, pumas, and jaguars, while the trees swarm with birds of brilliant plumage. Great snakes, among them the dreaded boa, glide through the underbrush, but are not so numerous as early writers believed. In the rivers are to be found sea-cows and great turtles, the latter valued for their flesh as well as for their eggs.

The Brazilian forest is by no means all waste, however, for some of the trees are useful and valuable. Dyewood and Brazil nuts are procured in abundance from the part of the jungle accessible from the rivers; and above all else, the famous Para rubber. Rubber production was long the chief industry of this part of Brazil, and until the last decade the greater

part of the india rubber of the world came from that section. At the present time, however, Brazil produces only about one-tenth of the world's rubber, supremacy having passed to the East Indies. This is due not to unfavorable growing conditions, but to scarcity of labor and to the absence of good transportation facilities.

Brazil's Great Source of Wealth. Brazil has the largest foreign commerce of any of the South American republics, exporting each year over \$600,000,000 worth of products; of these, coffee forms over sixty per cent. Brazil is the great coffee-growing country of the world; it produces two-thirds of the total supply. The industry centers in the state of São Paulo, in the southern part, and is of such great importance to the region that the government has taken all possible measures to advance it. The southern states of Rio de Janeiro, Minas Geraes, and São Paulo are very different in their general prosperity from the backward, undeveloped states of the interior, and the difference is due to coffee. Practically all the coffee used in the United States and Canada comes from Brazil.

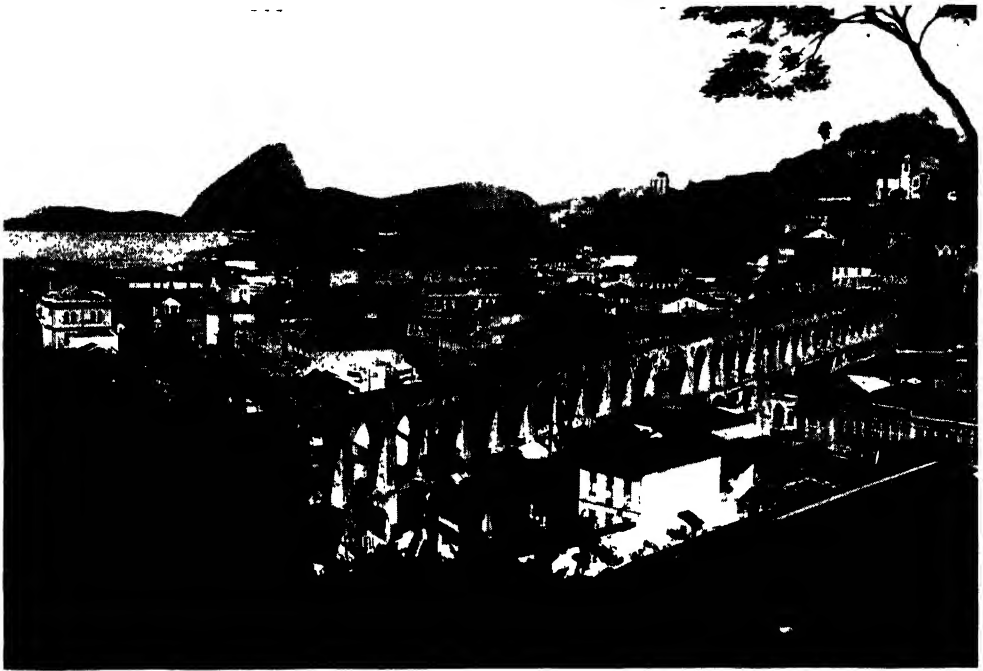


Photo U & U

RIO DE JANEIRO, THE BEAUTIFUL CAPITAL CITY

In the far distance is the famed Sugar Loaf. A beautiful drive, not shown in the illustration, extends for miles along the shore of the bay.

Other Agricultural Products. There is much fertile land in the republic, but only a very small portion of it has been put under cultivation. Second to coffee in importance is sugar, which is produced in the Atlantic coast states, and next comes cotton, which every state produces to a greater or less extent. Tobacco is also grown, but of inferior quality.

Brazil has scattered throughout its vast area much excellent grazing land, which would make possible the raising of enormous herds of cattle. Three or four of the states have developed the cattle industry, and it is growing steadily. Exports of leather, hides, and meat are increasing.

Mining. Once Brazil was the leading country of the world in the production of gold and diamonds, Minas Geraes being especially rich in gold. The source of this earlier gold was chiefly, however, the sand and gravel along the rivers, and such a surface supply could not last long; and the opening of the fabulously rich diamond mines of South Africa caused those of Brazil to decline. Gold still exists in large quantities, but the lack of capital and of energetic legislation in favor of mining has retarded the industry. Iron, lead, copper, silver, and a few of the precious stones are also present, but the scarcity of fuel prevents the development of these riches, for the country has little coal, and what it has is of poor quality.

Manufactures. This scarcity of coal has interfered with the development of manufactures, but of recent years there has been a decided increase in these, the waterfalls being utilized in many cases to furnish power. Chief of the manufacturing industries is the spinning and weaving of cotton; nearly every city has extensive cotton mills. Next is the making of woolen goods, but silk manufacturing is increasing. Sugar is also refined, and in some years is second in value among Brazilian products for export.

Government. Brazil is a republic, with a constitution modeled on that of the United States. This permits the states large functions, but the tendency has been in recent years to concentrate greater power in the Federal government than is the case in the United States. In addition to the twenty states, there is a Federal District, in which the capital is located, and a Federal Territory, inland from Rio de Janeiro, purchased in 1902, to which some day the capital of the republic is to be moved.

At the head of the republic is a President, elected by direct vote for a period of four years; he is not eligible to two terms in succession. His Cabinet of seven Ministers is appointed by him, and is not responsible to the legislative body. This latter consists of two houses, a Senate and a House of Deputies. Each of the

OUTLINE AND QUESTIONS ON BRAZIL

Outline

I. Location and Size

- (1) Latitude, 34° south to 5° north
- (2) Longitude, 35° to 74° west
- (3) Boundaries
- (4) Length, 2,600 miles
- (5) Breadth, 2,700 miles
- (6) Actual area, 3,285,313 square miles
- (7) Comparative size
- (8) Population

II. Surface and Drainage

- (1) Brazilian Highlands
 - (a) River gorges
 - (b) Sea Mountains and other ranges
- (2) Basin of the Amazon
 - (a) Largest unexplored area on western hemisphere
 - (b) Vast forests
- (3) Northern plateau
- (4) Rivers
 - (a) Amazon
 - (b) Paraguay
 - (c) Paraná
 - (d) São Francisco
 - (e) "River of Doubt"

III. Climate

- (1) Tropical character
- (2) Variations due to altitude
- (3) Rainfall
- (4) Unhealthfulness of certain localities

IV. Resources

- (1) Forests
- (2) Agriculture
 - (a) Coffee
 - (b) Sugar
 - (c) Cotton
- (3) Stock-raising

- (4) Mines
- (5) Manufactures

V. People

- (1) Portuguese origin
- (2) Mixture of whites, Indians, and negroes
- (3) Influx of Italians
- (4) Language
- (5) Education
 - (a) Lack of compulsory school laws
 - (b) Greater progress of coast states
- (6) Religion
- (7) Cities

VI. Transportation and Commerce

- (1) River travel
- (2) Railroads
- (3) Steamship connection
- (4) Largest foreign commerce of any South American country

VII. Government

- (1) Republican form
- (2) "States' rights" features minimized
- (3) Executive department
- (4) Legislature
- (5) Local government

VIII. History

- (1) Discovery and settlement
- (2) Portuguese rule
- (3) The negro revolt
- (4) Period of Spanish domination
- (5) Brazil the seat of Portuguese government
- (6) Independence achieved
- (7) Reign of Pedro II
- (8) Establishment of republic
- (9) Later development

Questions

In what peculiarity of location do practically all of the large cities of Brazil resemble each other?

What city is more than 1,000 miles inland, yet is a seaport?

What great change took place in the appearance of the capital city during the latter part of the nineteenth century?

What evidence of beautiful and permanent nature exists to denote a warm friendship between Brazil and the United States?

What Brazilian city is nearest American and European ports?

What legislative body in the United States compares with the House of Deputies of Brazil?

What city has grown very large because it is in the heart of the coffee area?

What Brazilian city of a quarter of a million people lies almost on the equator? Is it a seaport?

OUTLINE AND QUESTIONS ON BRAZIL—Continued

What was the Line of Demarcation, by whom was it decreed, and what effect did it have upon Brazil?

In what way was Theodore Roosevelt identified with the exploration of the country?

What part of the world surpasses Brazil in rubber production?

Why is Brazil called one of the A-B-C countries of South America?

Is the Portuguese language spoken anywhere outside of Portugal and Brazil?

Is Rio de Janeiro destined to remain the capital city?

What piece of sculpture symbolizes the friendship existing between Brazil and the United States?

What are the local names for some of the large cities?

What is the "River of Doubt," and why was it so called?

Are the railroads owned privately, by the states, or by the national government?

Which of these plans do you consider best for the people?

Has Brazil one of the two largest cities in the world lying south of the equator?

Rio de Janeiro is the capital of the republic. Is it also the capital of the state in which the Federal District is located?

Where in Brazil is the mountain called the Sugar Loaf?

What great Brazilian island can be inhabited only during part of the year?

Where is the largest unexplored area in the western hemisphere?

Is it an absurdity to speak of a "cotton tree"? Why?

If a trail were cut through the Amazon jungle in the spring, would it be easily followed in the autumn? Why?

With what great European ruler was Brazil's most famous emperor connected by marriage?

How would the United States suffer if commerce with Brazil were cut off?

Compare the country as to size with the United States and Canada.

If the inhabitants of the United States were transferred to Brazil, how much more densely populated would that country be than it is at present?

What advantage have the children in the coast states over those in the inland regions?

How does it happen that Brazil is Portuguese rather than Spanish, like the rest of South America?

How long would it take you to go from New York to Rio de Janeiro? From Para to London? From New York to Pernambuco?

Why are laws relating to freedom of worship unnecessary?

How many times as much rain falls in the Amazon basin each year as in the best-watered part of the United States?

Four men in a restaurant in Bahia were charged for their dinner ten thousand *reis*, a *rei* being the thousandth part of a milreis. How much, in American money, did each have to pay?

Why has it been more profitable to allow excellent grazing lands to lie idle in most parts of the country than to raise cattle on them?

Why would it not be good advertising to state that cigars were made of Brazilian tobacco?

How did the country get its name?

Why would you not care to live in the Amazon region?

What is the country's great source of wealth? How large a part of the industries centers about it?

How large a part of the Amazon system lies within this one country?

What food besides fish does the Amazon furnish?

What valuable product is received from the "up-river *hevea*" tree?

Name three things which the great forests yield.

When was the capital of Brazil the capital of another country as well?

Describe briefly the harbor of Rio de Janeiro.

Why is Brazil not the leading rubber country to-day?

twenty states, as well as the Federal District, elects three senators, who remain in office for nine years. The lower house consists of 212 members, elected for three years. Each state has its own governor, legislature, and judicial system, and is divided into districts for the purpose of local government.

History. The discovery of America by Columbus in 1492, and of the Cape of Good Hope by Da Gama six years later, were both the result of maritime enterprise fostered in the period of Portugal's glory by Henry the Navigator, called by Thomson—

The Lusitanian prince who, Heaven inspired
To love of useful glory, roused mankind,
And in unbounded commerce mixed the world.

The coast of Brazil was first reached in 1500, by Vicente Pinzon, a Spaniard, who claimed it for his king. But since it proved to be east of the line of demarcation fixed by arbitration of the Pope between the fields for exploitation by the Portuguese and by the Spanish, Spain yielded its claim to the region. The first settlement was made in 1502, on Rio de Janeiro Bay. Bahia was founded in 1549. Between 1532 and 1545 there were formed twelve proprietary divisions of the coast, lying between latitudes 30° S. and the equator, but in only six the proprietors took advantage of the opportunities offered them. An attempt was made to enslave the Indians, but this was abandoned in 1680, in deference to the priests. African slavery followed, negroes being imported for the purpose.

From 1580 to 1640, the Spanish royal house controlled both Spain and Portugal. Gold was discovered in 1601, and diamonds were found about a score of years later. When Portugal was invaded by the French, in 1807, the Portuguese royal family fled from Lisbon to Brazil; Rio de Janeiro was for fourteen years the seat of the Portuguese government. In 1821 the king returned to Lisbon, leaving his son Pedro as regent of Brazil; but in the following year the great colony proclaimed its independence and chose the regent to be its emperor.

under the title of Pedro I. He proved a worthless ruler, and after nine years was induced to abdicate, leaving his crown and scepter to his son, who succeeded to power at the age of fifteen years, under the title of Pedro II. The long reign of this ruler was beneficent, and early won the respect of the world.

Dom Pedro II represented three of the great royal houses of European history—the Braganzas, the Hapsburgs, and the Bourbons. His mother was a sister of Napoleon's second wife, and his stepmother, a granddaughter of Napoleon's first wife. His life, public and private, was free from blemish. There were few wars in his reign. In 1825 there was a short contest with the new republic of La Plata (Argentina) for the possession of Uruguay, which fell to neither power, but retained its independence.

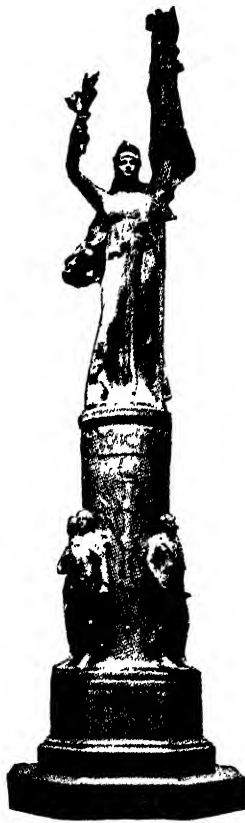
From 1860 to 1865, Brazil was compelled to wage war in concert with Argentina and Uruguay, against Francisco Lopez, the dictator of Paraguay, who preferred death to surrender. Dom Pedro issued an imperial decree for the gradual abolition of slavery, in 1871, deeming this the best method of ridding the nation of that system. In 1888 he proclaimed total emancipation. Throughout all the years of his long reign, he was the patron of art, letters, science, production, commerce, and public benevolence.

In 1874 and again in 1876, Dom Pedro visited the United States, where he enjoyed unbounded popularity, and where he chose for his most intimate friends the men of letters with whose works he was familiar. The feelings of the people were happily expressed in the words of Whittier:

Wear unashamed a crown by thy desert
More than by birth thy own,
Careless of watch and war; thou art
begirt
By faithful hearts alone.

The visit of the North American scientist, Louis Agassiz, to Brazil in the preceding decade was a matter of general as well as scientific interest.

In 1889 Dom Pedro, the benign sovereign, was deposed, his opponents thus anticipating the republic for which



"AMICITIA"

The colossal figure in bronze holds in her right hand a spray of laurel, while supporting with her left hand the flags of Brazil and the United States of America intertwined with laurel and palm, indicative of prosperity and peace. This figure is set on a lofty and imposing pedestal of stone embellished with bas-reliefs, at the foot of which are four standing figures—George Washington and Abraham Lincoln representing the United States of America, and Jose Bonifacio and Rio Branco representing Brazil. On the lower portion of the pedestal are three bas-reliefs depicting the signing of the American Declaration of Independence, Dom Pedro I declaring Brazil's independence of Portugal at the Ypiranga River, and a scene allegorical of lasting friendship.

he was seeking to prepare his people. Two years later the people adopted a republican constitution, patterned to a great degree after that of the United States.

The country allied itself with the nations which fought Germany in the World War, but its support was rather moral than material. In 1922 occurred the centenary of the establishment of the Brazilian nation, and a great exposition signalized the event. As a permanent memorial of the centennial and to symbolize the warmth of feeling of the United States, that country presented to Brazil a fine monument called *Amicitia*, or *Friendship*.

Brazil was one of the original members of the League of Nations, but resigned from membership in 1927, when its ambition to hold one of the permanent seats in the Council of the League was thwarted S.G.DoA. AND W.W.S.

Related Subjects. The reader who is interested in Brazil will find helpful the articles on the following topics

CITIES AND TOWNS

Rio de Janeiro will be found in its alphabetical place in these volumes Other large cities are described above

LEADING PRODUCTS

Coffee	Gold
Cotton	Rubber
Diamonds	Sugar

RIVERS

Amazon	São Francisco
Madeira	Tapajos
Paraguay	Uruguay
Paraná	

MISCELLANEOUS

Boa	Gama, Vasco da
Demarcation, Line of	Pedro II



Photo Visual Education Service

BRAZIL NUT

The opening shows the fruit

BRAZILIAN RUBY. See TOPAZ.

BRAZILIAN SAPPHIRE, *saf' ire* See TOURMALINE.

BRAZIL NUT, OR PARA NUT, the edible seed of a beautiful South American tree be-

longing to the myrtle family. The tree grows as high as 150 feet, and is very abundant along the Amazon and Orinoco rivers. The leaves are bright green and leathery, and are ordinarily two feet long and six inches wide. The cream-colored flowers produce very hard-shelled fruits nearly six inches in diameter and about the color of coconuts. Each fruit contains about twenty of the well-known three-sided, wrinkled seeds, or nuts, tightly fitted into the shell. These nuts are eaten as delicacies, are used for dessert and candies, and they yield an oil employed in oil painting, oiling of delicate machinery, lighting, and sometimes for cooking. In America, the nuts are popularly called *nigger-toes* and *cream-nuts*. B.M.D.

Classification. The botanical name of the tree described above is *Bertholletia excelsa*

BRAZOS, brah' zose, RIVER, the largest river of the interior of Texas, is formed by the junction of two streams called the Clear and Salt forks. It flows southeast by a winding course, and empties into the Gulf of Mexico, forty miles southwest of Galveston. It has a length of 600 miles, and is navigable for local commerce at all seasons for forty miles from the Gulf.

BRAZZAVILLE, brah zah veel', capital of Middle Colony of French Equatorial Africa (which see).

BREAD, the most widely used food of civilized man. For centuries it has been of such overshadowing importance that it has become commonly known as the "staff of life." Figuratively, the name is often applied to food in general, as in the Biblical passages, "Give us this day our daily bread," or, "Man shall not live by bread alone," or in the old couplet—

Seven wealthy towns contend for Homer dead,
Through which the living Homer begged his bread

What Bread Is. People in various times in history have meant very different things when they have used the word, just as to-day people the world over vary in their ideas regarding this "staff of life." But always there is general agreement, in that the principal ingredients are water and some sort of meal or cereal. The loaves may be large and light, brown without and white and flaky within; or they may be small, tough, flat cakes, grayish-white and gritty with ashes. They are all bread, however, to the people who eat them.

In the most advanced countries, wheat is the common grain for bread, because it makes lighter, better-tasting food, and is more easily digested. The peasants of some parts of Europe, particularly of Russia, the countries formed from the dismembered Austria-Hungary, and the Balkan states, still live largely upon a black bread made from rye, while others make their

WHITE BREAD

Fat
1.3

Ash, 11

This was not a mere fairy tale. There are many people in the West Indies and in Africa who use the roots of various plants for making bread, and in some cases these roots are poisonous unless properly prepared. The West Indians use cassava, which is manioc under another name, and make their little cakes by hand, just as the Swiss Family Robinson did.

Kinds of Bread. All these breads, no matter how different they may look or taste, fall into two classes. They are either *leavened*—that is, fermented or “raised” with some sort of yeast or baking powder—or *unleavened*, baked without “rising.” Undoubtedly the latter form, which is the simpler, was the earlier, but the process of making leavened, or fermented, bread must have been understood for thousands of

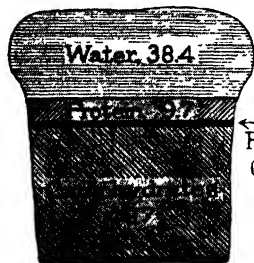
years, for the book of *Exodus* distinguishes between the two kinds. The yeast plant used to-day was not known, but leaven, consisting of a portion of dough which had been allowed to ferment, answered the purpose. The Egyptians, doubtless by accident, seem to have discovered the possibility of making bread light in this way, and the Jews, as well as the Greeks, probably learned it from them. Yeast as “rising” has not everywhere taken the place of leaven to this day.

Of breads not raised with yeast or baking powder, the most common are *salt-rising* bread, in which the ferment necessary to lightness is brought about by a sour batter of corn meal and milk; *aerated* bread, made with water which has been charged with carbon dioxide; *gluten* bread, made from flour which has been

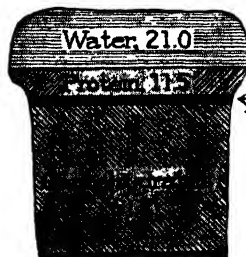
bread of oats. The people of the United States, Great Britain, and Canada, as well as those of France, think that wheat is the world's most important cereal; but more people are fed on rice than on any other grain, and throughout much of the Orient, it is not only boiled whole, but ground up into flour and made into bread. In the United States, the people of the South use much corn meal, and in many places in the Southland when bread is spoken of, it is the corn *pone* or *dodger* that is meant, wheat bread going under the name of *light bread*.

Many countries have their characteristic or “national” kinds of bread, which are used in addition to the regular wheaten loaves. Thus, Scotland has its *oat cakes*, and its *bannocks* of barley meal; the Central American countries have their *tortillas*, which are cakes made of crushed and parboiled corn; the United States and Canada have their *hot biscuits*. Different conditions, too, call for various kinds of bread. Ships which are to make long voyages must have a bread that will keep indefinitely, and to meet this demand, ship's biscuit, or *pilot bread*, is made in large quantities. It is simply flour mixed with water and baked slowly, and it is so hard that excellent teeth are required for chewing it.

Every child who has read *The Swiss Family Robinson* remembers the fascinating account of the making of bread from manioc roots. The roots were grated, and the pulp was then placed under heavy weights and squeezed dry, for the wise head of the family knew that the juice was poisonous.

WHOLE
WHEAT
BREADFat
0.9

Ash, 1.3

TOASTED
BREADFat
1.6

Ash, 1.7

CORN BREAD

Fat
4.7

Ash, 2.2

freed of much of its starch; the oaten cakes, bannocks, and corn pone mentioned above; and the various kinds of *crackers*, or *biscuits*, as they are called in England. These latter may contain many ingredients besides cereal and water—may have shortening, flavoring, fruits, or meat juices introduced to improve their taste or food value. *Pancakes* made from specially prepared self-rising flours contain the elements which, when moistened, produce the necessary fermentation.

Of leavened breads, by far the most familiar and important to the people of America is the white wheat bread, made with yeast. Other flours may be combined with or substituted for the wheat, but the principle remains unchanged. In some forms of bread, however, as in biscuits, muffins, corn bread, and many of the popular brown breads, baking powder or soda is used as the leavening agent. Against the chemical mixtures known as baking powders, there has been much prejudice, but under the pure-food laws their possible harmful effects have been largely done away with. The housewife should be careful, however, to use only a kind of whose purity she feels sure.

How Yeast Bread Is Made. Many housekeepers, especially in the country districts, still make their own bread, but in recent years the bakeries have done a large proportion of the work. In most cities, the day has passed when dirty, unsanitary underground bakeries are permitted to exist, and many of the large bakery companies have put up great factories which are marvels of cleanliness. In these, the public is invited to inspect the process of manufacture in all its stages, so it may realize that the advertising slogan, "Yours are the first hands that touch our bread," is no empty boast. In such sanitary bakeries, all the work is done by machinery, even to the wrapping of the loaves in oiled paper.

The process is much the same whether bread is made in the home or in a great bakery, but it is rather more interesting to watch in the latter place. Most bakers use compressed yeast cakes, which are dissolved in warm water and mixed with enough flour to make a thin paste, or *sponge*. This is left to ferment for two or three hours in a temperature of from 70° to 75°, and is then ready to be made into dough. Salt, milk, lard, a little sugar, and enough flour to make a good stiff dough are then added, and the whole is dumped into a mixer, where it is thoroughly stirred and kneaded by iron arms, that the ferment may reach every part of the mass. The mass is then left to rise for several hours, and as it gets light it is occasionally beaten down and kneaded, that the large gas bubbles which have formed may be broken into little ones.

When the practiced baker sees that the dough is light enough, it is separated by a

dividing machine into small pieces, then is rolled into loaves, and placed in pans, which are again allowed to stand for a short time before being put into the oven. During all these "rising" stages, care must be taken that the dough does not get too warm, or sour bread will result.

An ordinary bakers' oven is circular, and will hold from 300 to 500 loaves at one time. The pans are slid in and lifted out with long wooden paddles, and all the men who attend to it in this as in its other stages are scrupulously clean, and are dressed in white. The temperature of the oven is 400° to 450° F., but the interior of the loaf rises only two or three degrees above the boiling point of water. Steam is sometimes admitted to the oven. This dextrinizes the starch of the crust, producing a glazed surface, which prevents evaporation of moisture from the interior, and so produces a moister loaf. On the average, nine pounds of flour yield twelve pounds of bread. Flour made largely from the hard spring wheats of the Northwest are what the bakers call *strong* flours. These take up more water than weak flours, and they give a higher yield of bread. On the average, white bread contains thirty-five per cent of water.

Test of Purity. Bakers are sometimes tempted to make their bread heavy by putting into it a great deal of salt, which cannot be











TEST FOR ALUM

To determine the presence of alum in bread, take a sample of the suspected article, place it in a saucer and pour over it a solution of carbonate of ammonia. If alum is present, the bread will turn black, but no changes will occur if the bread is pure.

detected by the taste. The salt makes the bread weight heavy, because of the moisture it retains. To test the relative food value, dry pieces of both a heavy and a light loaf in a slow oven. The heavier of the two will throw off more moisture and be lighter after heating, therefore less nutritious than the other.

It is well known that alum is sometimes added to bread to make it white, and to cover up the use of a dark, cheap flour. Its presence may be detected by pouring a solution of carbonate of ammonia over the bread. If it contains alum, it will turn black; if it does not, there will be no change of color. While small quantities of alum are not harmful to the sys-

1lb. plain bread  1220 food units	1lb. eggs  720 food units	1lb. potatoes  385 food units	1lb. milk  325 food units
1lb. beans  1500 food units	1lb. fish  450 food units	1lb mutton leg  950 food units	1lb round steak  745 food units

A COMPARISON OF FOOD VALUES

Meat is sixty per cent water. Bread is nearly forty per cent water. There is more energy stored in a pound of bread than in a pound of meat or in any other foods illustrated above, except beans

tem, the use of this substance to deceive the purchaser is a practice contrary to the pure-food laws.

Food Value. Well-made bread is wholesome and nourishing, but it does not contain all of the food elements in sufficient quantities to make by itself a perfect food. Its deficiency in fats is commonly made up by eating it with butter. Bread that is soggy and heavy is liable to be harmful, the digestibility increasing with its lightness and with thorough baking. There has been much controversy as to whether white wheat bread or one of the darker breads which contains the bran as well as the flour is the better. There is more indigestible material in breads made from bran, Graham flour, and whole-wheat flour, and these breads are more laxative than white bread. Whole-wheat bread is especially valuable for its vitamins and mineral salts. Generally speaking, it is a good plan to serve the coarser breads along with white bread. When the family diet includes an abundance of fresh fruits and vegetables, it is not so important to serve the dark breads, but when the margin of safety as regards mineral salts is small, it is unwise to limit the bread allowance to white-flour preparations. Excessive use of bran bread may be undesirable, because bran tends to irritate the intestines. In cases of children and invalids, it is a good idea to have the advice of a physician on this point. See HOME ECONOMICS (Buying for the Table).

Bread should be very well chewed, because it is a starch food, and the saliva helps to digest the starch. The only harm that hot breads, long looked upon as extremely unwholesome, can do, arises from the fact that the inside, or "crumb," is easily compressed into a solid mass and swallowed before the saliva has a chance to mix with it. Crusty breads or rolls are better than softer breads, because they call for more chewing. Breads become stale by losing water, about fourteen per cent being lost in the course

of a week. Stale bread can be refreshed by heating to about 300° F.

All in all, probably no other food returns better value for money expended than does bread; Benjamin Franklin, on his first arrival in Philadelphia, acted with characteristic wisdom when he spent his last penny for "three wheaten rolls." See FOOD (Chemistry of Foods). E.V.M'C.

BREAD AND BUTTER STATE, one of the popular names applied to Minnesota (which see).

BREADFRUIT, one of the most important food staples of tropical islands in the Pacific Ocean. It is a rounded or oval fruit, about the size of a child's head, with a rough rind and a mealy pulp. Breadfruit is gathered for eating before it is ripe, and is cooked with the heat of hot stones. The island inhabitants also prepare it to keep for several weeks, either by baking it whole in close, underground pits, or by beating it into paste and storing it underground, where a slight fermentation takes place. The edible part lies between the skin and the core, and has somewhat the consistency of new bread. Mixed with coconut milk, it makes an excellent pudding. The inner bark of the tree is made into a kind of cloth. The wood, when seasoned, closely resembles mahogany, and is used for the building of boats and for furniture.

The tree grows to a height of about forty feet, and is often limbless for half of its height. The spreading upper branches bear glossy, dark-green leaves over a foot in length, and the fruits hang singly, or in clusters of two or three, by short, thick stems. In some of the Pacific islands, where the population is gradually dying out, the breadfruit tree is said to be facing extinction.

The breadfruit tree has been cultivated in Southern Florida, but the fruits are not seen in Northern markets, as they do not bear shipment well. (See illustration, page 938.) B.M.D

Scientific Name. The breadfruit tree belongs to the mulberry family, *Moraceae*. Its botanical name is *Artocarpus incisa*.

BREAKFAST FOODS are cereal preparations made from wheat, oats, corn, and rice, and to a limited extent, from barley. Rice, however, is used less as a breakfast food than as a dish for other meals. As prepared for table use, these grains, with the exception of oats, have large amounts of carbohydrate material (chiefly cellulose and starch), smaller quantities of water and protein, and still smaller amounts of fat and mineral matter. Ordinary oatmeal is over seven per cent fat; therefore it is a good heat-producing food. In the rigorous climate of Scotland, oat preparations have been used for centuries to build "brain and brawn."

The nutritive value of any cereal may be considerably modified during the process of preparing it for market. Some of the widely advertised cereal products have been so devitalized by milling and cooking processes that their value for growing children is slight. The most nutritious breakfast foods are those made from the whole grain, purchased uncooked, and prepared for the table by slow cooking in a double boiler. Valuable salts and vitamins are thus preserved, and the foods are rendered sufficiently digestible by softening of the cellulose. The normal boy or girl should never be given breakfast food advertised as "predigested," since the healthful functioning of the digestive system depends upon a natural stimulation of the digestive glands. Because the proteins in cereals are less efficient for supporting growth than those in milk, the custom of serving milk and cream with breakfast cereals is based on sound dietetics.

The processes involved in the manufacture of commercial breakfast foods include crushing, rolling, shredding, toasting, and steaming. By sudden heating, the moisture in the kernel can be made to expand quickly, and the result is a puffed cereal. Shredded-wheat biscuit and flakes of various kinds are prepared by

dry heating, which changes part of the starch into dextrin (which see). E.V.M'C

Related Subjects. See NUTRITION, and list of related subjects; also, each of the grains mentioned above.

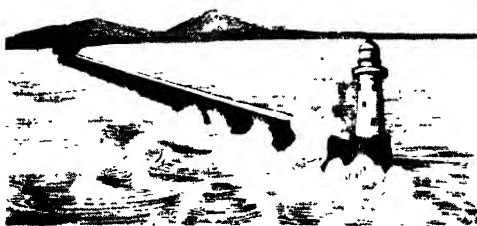
BREAKWATER, a solid structure of masonry or other construction placed between a harbor and the open navigable water, to serve as a protection against the violence of the waves. Breakwaters are usually constructed by sinking loads of stone along the line selected and allowing them to settle under the action of the waves. When a thorough foundation of stone and gravel has been secured and the mass rises toward the surface, it is surmounted by a pile of masonry, sloped in such a manner as will best enable it to resist the action of the waves. Among the greatest breakwaters are those of Cherbourg, in France; Plymouth, in England; Delaware Bay and Buffalo, in the United States; and Valparaiso, in Chile. In less important localities, floating breakwaters are occasionally used. These are built of strong,

open woodwork, partly above and partly under water, and are divided into several sections and secured in position by chains attached to fixed bodies. The breakers lose nearly all their force in passing through the beams of such a structure. On the

Great Lakes, breakwaters of wood piling, filled with stone, are frequently employed.



BREADFRUIT OF THE PHILIPPINE ISLANDS



BREAKWATER PROTECTING A HARBOR

BREASTED, *brest' ed*, JAMES HENRY (1865-), professor of Egyptology and Oriental history at the University of Chicago, and one of the most eminent archaeologists of his time. Since 1925 he has been relieved of teaching responsibility, and has been in charge of the

excavations undertaken by the university's Oriental Institute in the Near East; of especial interest has been the uncovering of ancient Armageddon in Palestine, under his direction. (See *ARCHAEOLOGY*.)

Professor Breasted was born at Rockford, Ill. He was graduated from Northwestern College in 1888, and in 1892 he received a master's degree at Yale University. Two years later, he obtained his Doctor of Philosophy degree from the University of Berlin.

Breasted became an assistant in Egyptology at the University of Chicago in 1894; in 1905 he was given the professorship he now holds. In addition, he was made chairman of the department of Oriental languages in 1915, and in 1919 became director of the Oriental Institute of the university.

The Royal Academies of Germany commissioned him, in 1900, to visit the Museums of Europe and to copy and arrange for an Egyptian dictionary the Egyptian inscriptions found in them. Archaeological expeditions made by the University of Chicago to Egypt in 1894 and 1905 and to Mesopotamia in 1920, were directed by Professor Breasted.

His Books. He has lectured and written extensively on the basis of his explorations. Among his published works are *A History of Egypt*; *A History of the Ancient Egyptians*, *History of Europe, Ancient and Medieval* (with J. H. Robinson), *Origins of Civilization*, and *The Edwin Smith Surgical Papyrus*.

BREATH AND BREATHING. Breathing, or the taking in and expelling of air, is so necessary a function that the expression, "he has stopped breathing," is equivalent to saying, "he is dead." It is a process to which little thought is given, however. The moment a person starts to watch his breathing or to count the intakes of air, he becomes self-conscious, and cannot breathe regularly or naturally.

Reasons for Breathing. Food and drink are necessary to the body, and yet under extreme conditions life may persist for hours or even days without them; but the body must have a constant supply of oxygen, or it will die. The act of breathing, or *respiration*, as it is more scientifically called, supplies this oxygen and carries off carbon dioxide, which has been produced by the various changes which take place in the body. The lungs constitute the special organ of breathing.

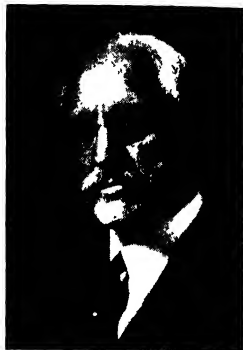


Photo U & U

JAMES H. BREASTED

Acts of Breathing. Breathing consists of two acts: *inspiration*, or breathing in, and *expiration*, or breathing out. These words suggest in their very form interesting connections—to *inspire* is to breathe into someone a special power of achievement; to *expire* is to draw the last breath—to die. Between inspiration and expiration are definite pauses which form part of the breathing movements, that after the expiration being considerably longer than that after the inspiration. With the taking in of air, the chest cavity expands, for the diaphragm flattens its dome, and the ribs are raised; with the expelling of air, the diaphragm again arches upward, and the ribs draw back into their places. The increase in the chest cavity is not very great in ordinary breathing, but forced breaths make it considerable. When the chest is expanded, the lungs follow this expansion, and become larger. The air then rushes into the air spaces, because of the slight vacuum formed within them. The act of respiration is usually unconsciously performed, except when a person deliberately tries to expel as much of the air from the lungs as possible.

Frequency of Breathing. No definite statement can be made as to the number of times a person breathes in a minute, for the variations are considerable. In general, however, the number of respirations is in a fairly definite proportion to the number of heart beats—one to four and one-half or five. A full-grown man or woman in good health may breathe normally from sixteen to twenty times in a minute—the average is eighteen—but exercise, illness, or certain personal characteristics may increase this range. There have been known cases of hysteria during which the patient breathed over 100 times a minute.

Lung Capacity. The quantity of air that is changed in each act of breathing, known as *breathing*, or *tidal*, air, is from twenty to thirty cubic inches, but this is increased during physical exertion of any kind. Over and above this normal thirty cubic inches, *complemental* air to the amount of about 100 cubic inches may be drawn into the lungs by the deepest possible inspiration, and about the same amount, known as *reserve* air, may be driven out by a forced expiration. But no matter how hard a person tries, he cannot expel all the air from his lungs. There remain always about 100 cubic inches, known as *residual* air. All in all, about 686,000 cubic inches of air pass through the lungs of an adult person every twenty-four hours; this amount may be doubled by continued exertion of any sort.

What Breathing Accomplishes. In passing through the lungs, the air gives up oxygen to the blood and receives in exchange carbon dioxide, or carbonic-acid gas, a waste; the exchange takes place in the tiny, thin-walled blood vessels of the lungs. The amount of

carbon dioxide carried out varies with the temperature and moisture of the air, the age, sex, muscular development, state of health, and the nature and quantity of food and exercise. In both sexes it increases to about the thirtieth year, and is greater in strong, healthy persons than in frail, slender ones. If this gas were not carried off, asphyxiation would result, just as surely as it does from escaping illuminating gas. By a remarkable provision of nature, the proportions and supply of oxygen and carbonic-acid gas are always assured. Plants breathe out, or exhale, oxygen, and they inhale carbonic-acid gas, to them a life-giving principle. Oxygen is the fuel needed by man to keep the fires of life going. Thus do plants and animals help each other.

Breathing in Relation to Health. Breathing is an instinctive act—that is, a person does not have to think or plan in order to breathe; and if conditions were always the best, this natural breathing would supply plenty of pure air. But many people find themselves under artificial conditions which are harmful—in crowded cities, where smoke makes the air impure, or in heated rooms, where the ventilation is not good. First of all, care should be taken to have the air as pure as possible. Out-of-door air is always better than that which has become heavy and dead within a room, even when the former is damp, or perhaps dusty. In the second place, deep breathing should be practiced. If as much air as possible is drawn into the lungs, and is then completely exhaled, the whole circulatory system is benefited. Five minutes of deep breathing each day will be found helpful, for such exercises warm up the body and put into action certain accessory breathing muscles. The air so breathed in should be fresh air, however. No matter how cold a room may be, such exercises should never be taken with the windows closed. Regular exercise in the open makes any special breathing exercises unnecessary.

Bad Breath, or Halitosis. This most troublesome condition may arise from any one of various causes—either from decayed teeth, catarrh, adenoids, bad tonsils, diseases of the stomach, or constipation. In any case, breath perfumes or even mouth washes do little good. If it is the teeth that are at fault, a dentist should be consulted; if any of the other organs are affected, a physician should be visited. Occasionally, where the case is not extreme or of long standing, a simple laxative and a gargle, as listerine or hydrogen peroxide, will be effective.

K.A.E.

Related Subjects. All of the articles in the following list will be found to contain additional information:

Adenoids	Drowning
Air	Life Extension
Catarrh	Lungs
Blood	Pulmotor
Stomach	Teeth

BRECCIA, brech' ah. See CONGLOMERATE.

BRECKINRIDGE, JOHN CABELL (1821-1875), an American soldier, statesman, and Vice-President of the United States during Buchanan's term as President. He was born near Lexington, Ky., and was a descendant of a long line of notable men. After graduating at Centre College, Ky., he practiced law for a time, then served in the Mexican War. On his return, he was elected to the state legislature, then to Congress, in 1851 and 1853. Near the close of his term as Vice-President, in 1860, he was nominated for President by the extreme Southern Democrats, but Lincoln defeated both him and John Bell (which see). He was elected to the United States Senate in 1861, but resigned to enter the Confederate army, in which he was a major general throughout the war. In Jefferson Davis's Cabinet, he was Secretary of War from January to April, 1865. After the downfall of the Confederacy, he went to Europe, returning to Kentucky in 1868 to practice law.



Photo: Brown Bros.

JOHN C. BRECKINRIDGE

BREECHES BIBLE. See BIBLE (Famous Versions of the Bible).

BREECHES-BUOY. See COAST GUARD.

BREEDING, the science of improving breeds of domestic animals, and species and varieties of plants. The main purpose in animal breeding is to develop some particular quality or characteristic, as the production of milk in the dairy cow, of speed in the race horse, of strength in the draft horse, of quality of wool in the sheep. The plant breeder seeks to increase the size and productivity of different plants, develop beauty and quality, or create new varieties.

Plant Breeding. There are two general methods utilized in plant breeding—breeding by *hybridization* and breeding by *selection*. Hybridization is the crossing of different varieties or species of plants, the ovules of one kind of plant being fertilized with the pollen of another. The individual plant that results from this process is a *hybrid*. Hybridization, when successful, may bring about increase of size, resistance to disease, better flavor, greater hardiness, and so on. Not all plants may be improved in this manner; the successes achieved by plant breeders are the result of careful experimentation over a long period of years. Examples of well-tested cross-breeding are the

hardy citrange, obtained by crossing the bitter Japanese orange and the common sweet orange; and disease-resistant grapes, produced by crossing imported and native American vines. The Shasta daisy, a hybrid produced by Luther Burbank, is an example of scores of new varieties created by that great breeder.

Breeding by selection has for its purpose the definite improvement of an existing species or variety, and consists in using the best possible individuals in propagation. It is usually, but not always, applied in the breeding of plants grown from seed. Essentially, it is the process of selecting the most perfect plants, planting the seed obtained from them, and continuing the process for several seasons, until a seed is obtained that assures a crop in the desired abundance and quality, or that will grow successfully in a given climate, such as the varieties of spring wheat grown in Minnesota, North Dakota, and Canada.

Breeding Domestic Animals. Breeding by selection has brought about the fine pure-bred cattle, horses, sheep, and swine of modern agriculture. To be a successful breeder, the owner of the stock must formulate distinct ideas as to the results he wishes to produce, and then work carefully and persistently toward their realization. The most successful breeders seek to improve their animals only in one quality; one cannot develop a successful dairy cow and a beef cow in the same animal. The most important principle in breeding is that *like produces like*, or the principle of heredity; therefore, the breeder selects his animals with the greatest care, giving more attention to the selection of the male, because his characteristics are more prominent in the offspring. The old saying, "Blood will tell," is especially applicable to stock breeding. Characteristics that have been developed through a long line of ancestors are more permanent than those of recent origin. Because of this law, the successful breeder places a high value on pedigree, or ancestry. Those unacquainted with the facts usually consider the high prices for blood-animals a foolish expenditure of money. For the breeder, however, such an outlay of money is a wise investment.

The mule, which is the offspring of the mare and the ass, is the most valuable animal produced by hybridization. Breeders cross other animals of different strain in the effort to bring about desired improvement, but in general, cross-breeding is of less importance than selection in the development of domestic animals.

R.H.

Related Subjects. The reader is referred in these volumes to the following articles, and to other references which will be found with them:

Burbank, Luther
Cross-Pollination
Eugenics
Evolution

Genetics
Heredity
Hybrid
Natural Selection

BREESE, Mrs. W. L. See GALE, ZONA.

BREITENFELD, BATTLE OF. See GUSTAVUS (II).

BREMEN, *brem' en*, the most important port of Germany, next to Hamburg. It is the capital of the state of Bremen, and is situated on both banks of the River Weser, forty-six miles from the North Sea. The older portion of the town, forming the business section, has narrow and crooked streets, but the modern part has fine boulevards, gardens, and handsome residences.

Bremen is the commercial center of North-west Germany, and has four harbors capable of accommodating the largest vessels afloat. The water area of the docks is about 125 acres, and the waterway is kept open in winter by ice breakers. The World War resulted in a great loss in tonnage; however, by 1925 Bremen had about regained its pre-war shipping level. The exports consist chiefly of woolen goods, linens, glass, hemp, hides, oil, wooden toys, and other manufactured goods. More than eighty per cent of the imports consist of food-stuffs. Previous to the World War, more immigrants to the United States and Canada sailed from Bremen than from any other European port. Population, 1925, 295,000.

BRENNUS, *bren' us*, OF GAUL. See THERMOPYLAE.

BRENT GOOSE, a variant of *brant goose* (which see).

BRESLAU, *bres' lau* See GERMANY (Principal Cities).

BREST. See FRANCE (Interesting Cities).

BRETAGNE, *breh tahn' y'*, the designation, in French, of Brittany (which see).

BRETHREN, CHURCH OF THE (sometimes called DUNKERS, DUNKARDS, or TUNKERS, from the German *tunken* meaning *to dip*), is a sect of German-American Baptists which was founded by a group of eight people in Schwarzenau, Germany, about 1708. Their leader was Alexander Mack. Early in their history, persecution compelled them to flee to Holland, and later they emigrated to the United States, where they settled near Philadelphia. They baptize believers by trine (threefold) immersion, and observe the rites of footwashing and the love feast in connection with their communion service. They are opposed to divorce, oaths, warfare, the use of alcohol and tobacco, and extravagant and immodest dress; they anoint the sick with oil, but do not oppose medical treatment. Disagreements have occurred, resulting in splitting the Church into three groups, called the Conservatives, the Old Order, and the Progressives; their membership is approximately 125,000, 3,000, and 25,000, respectively.

BRETON, *bre toN'*, JULES ADOLPHE (1827-1906), a French painter of peasant life, born at Courrières. He began his career as a painter

of historical subjects, but soon discovered that his genius lay in depicting the life of the peasants among whom he was born. His works are characterized by tender feeling, but they lack that strength and power which mark Millet's work. Breton's most famous canvas, *Return of the Gleaners*, and his *Blessing the Grain and The Reaper*, are in the Luxembourg Gallery, Paris; the Art Institute of Chicago possesses his famous *Song of the Lark*. Other characteristic works include *Women Weeding*, *The Potato Harvest*, and *Planting a Calvary*. (See illustration, page 943.)



JULFS BRETON

[Breton also wrote both poetry and prose. Among his literary works are *Jeanne*, *The Life of an Artist*, *A Peasant Painter*, and *The Fields and the Sea*.]

BREVET, *bre vet'*, a military title conferred on a commissioned officer who receives honorary rank higher than that which he holds in his regiment. It does not carry with it any increase of pay, and does not entitle the recipient to seniority over officers of equal rank, except when in the field. In the United States army, officers are addressed by the title of their brevet rank. In the British army, officially, both titles are used. For instance, a captain receiving a brevet majority would be styled "Captain and Brevet Major ———."

BREVIARY, *bre' vih a rie*, a book containing the prayers, mostly Psalms, which in all sacred Orders of the Roman Catholic Church must be recited daily, unless excused by Papal permission. The breviary is printed in four volumes, one for each season of the year. The *Missal* contains the various prayers which must be read or sung by the celebrant in the celebration of mass. The *Ritual* contains the prayers and various blessings used in funerals, baptisms, and marriages.

BREWER, MOUNT. See CALIFORNIA (Surface Features).

BREWING, the process of making from barley and other cereals such beverages as beer and ale, which are fermented but not distilled. In popular usage, the term includes all the steps in the process, but technically this is untrue. The manufacturers distinguish between *malting* and *brewing*, which are really two separate processes. In order to make the explanation as simple as possible, the distinction will be kept in this article. Only the fundamental processes are given.

Malting. The first step is to generate the ferment, *diastase*, which will change the starch in the barley or other grain to maltose and dextrin. This is done by malting, or causing the grain to germinate. It is first steeped in water for forty-eight to seventy-six hours, the water being drawn off and renewed at least once a day during this period. When the grain has absorbed enough water to soften it, it is taken from the steeping tanks and piled in a nicely leveled heap about two feet deep on the "germinating floor." This is called *couching*. The grain then begins to sprout, and must be carefully watched. As soon as the rootlets appear, it is *floored*; that is, spread out to a depth of ten inches or less. The sprouting must be regular, not too fast or too slow; the temperature must be varied for different grains, and germination must be checked when the sprouts are two-thirds the length of the grain. The checking is done by heating the grain in a dry kiln. The temperature is raised by stages to 150° F. for light beer, and 220° F. for dark beer. The malt is then dry and crisp.

Brewing. When the malt is thoroughly dry, it is ready for brewing, and this is the second process. It is crushed (*bruised* is the technical term) between iron rollers, and is then mixed with warm water, forming a *mash*, which in the German process has the consistency of a breakfast porridge, but in the English is much thinner. Both processes have been employed in the United States.

The mixture is placed in mash tubs, and sufficient hot water is added to bring the mixture to the desired temperature. *Diastase* is most active at 145° F., and for some time the mash is kept at about that temperature. Eventually, however, it is further heated, reaching 158° in the English and 167° in the German process. During the heating the mash is stirred by a mechanical device. At last, the liquid is drawn off from the grain, or grist. The liquor in this stage is called the *wort*.

The next step is to boil the wort with hops, from one to twelve pounds of hops being used to 100 gallons of wort. The boiling lasts from one to six hours. The boiled wort may be cooled in a number of different ways—by running through pipes immersed in cold water, or by trickling over pipes through which cold water or liquefied carbon dioxide is flowing, or by using a surface cooler. The last method involves the use of a shallow vessel which allows a large surface to cool rapidly from exposure to the air.

From the cooler, the wort is run into fermenting vats or tubs; about five pounds of yeast are used for every hundred gallons of wort. There are two varieties of yeast used, one of which is most active at ordinary temperature (60° to 68° F.), the other at a lower temperature (43° to 46° F.). Both convert



THE SONG OF THE LARK

From the painting by Jules Breton

the malt sugar and dextrin into alcohol and carbon dioxide. In the case of the high-temperature yeast, the escaping gas carries the yeast to the surface of the liquid, producing what is called *top fermentation*. The low-temperature yeast remains at the bottom, giving bottom fermentation. Bottom fermentation is used for lager beer, top fermentation for ale, porter, and stout. After several days, the fermented liquid is run into settling vats, where any remnants of the yeast rise to the surface in a scum. The beer is then ready to be drawn off and stored in casks or barrels until it matures.

Chemistry of Brewing. Malting and brewing are highly technical subjects, demanding an expert knowledge of chemistry and microbiology. The success of every step in the process, from crushing the grain to storing the "green" beer, depends on many factors. The length of time devoted to every process, the temperature of the mixture, and the kind of water used, all affect the beer. The amount of alcohol is dependent almost entirely on the temperature in making the wort, a high temperature yielding little alcohol. If the temperature is not kept right while the wort is being made or while fermentation is taking place, the entire brew will be spoiled. The water must be analyzed, and if necessary, suitable salts must be added to it. Thus, water for mild ale must be rich in sodium chloride (common salt), and that for pale ale must contain an adequate quantity of calcium and magnesium salts. The water used in malting must be moderately hard.

In making beer and other malt liquors, the starch in the grain is changed into sugars and dextrin during the mashing. The hops clarify, preserve, and flavor the liquor. Fermentation decomposes the sugars, such as *maltose*, and some of the dextrans, into alcohol and carbonic-acid gas. It is estimated that 100 parts of sugar, when fermented, yield fifty parts of alcohol and forty-seven parts of carbonic-acid gas, besides a little glycerine and other products. In many modern breweries, the carbonic-acid gas is collected and converted into a liquid by cooling and compression. In the brewery itself, this carbon dioxide is used in the cooling pipes (see above), in charging the finished beer with gas, and, in place of pumps, to force the beer from the storage cellar into the bottling room.

T.B.J.

Related Subjects. In the following articles will be found much information of interest in connection with this topic

Ale	Fermentation	Malt
Beer	Hops	Yeast

BREWSTER, WILLIAM (1560-1644), one of the best-known of the early American colonists, the leader of the Pilgrims who came to America in 1620 in the *Mayflower*. In his home in Scrooby, England, the Dissenters from the Established Church were accustomed to meet

for worship each Sunday, contrary to the edict of authority, and he was one of the company who went to Holland in 1608 to escape persecution. Until the emigration to America in 1620, he supported himself at Leyden by teaching and book publishing. For twenty-four years a leader of the Plymouth colonists, he helped to make the colony prosperous by his energy and cheerfulness. He was generally known as Elder Brewster, and for several years was the only preacher among the colonists. See PILGRIMS; PURITANS; PLYMOUTH COLONY (The Honored 102).

BRIAN BORU, *bri' an bo roo'*. See IRELAND (History: The Coming of Invaders).

BRIAND, *bre aNd'*, ARISTIDE (1863-), a French statesman, the first Socialist to become Prime Minister of France. To that post he was called eleven times within a few years, six of those times while

France was struggling to overcome its domestic difficulties after the World War. Briand was trained for the law, but even as a young man he devoted all his time to journalism and politics. Entering the Chamber of Deputies as a Socialist Radical in 1902, he won prominence by his keen powers of analysis and exposition of complex subjects. He was chairman of the committee which drafted the bill separating Church and State, and in 1906, as Minister of Public Instruction and Worship, with great tact put the law into effect.

In 1909 Briand became Prime Minister. Though he was a professed Socialist, under the responsibilities of office he became more and more conservative, and was finally expelled from the Socialist party. He resigned in 1911, but was again Prime Minister in 1913 for a short time. In August, 1914, he was appointed Minister of Justice in the Viviani Ministry, which fell in October, 1915, as a result of the diplomatic failures of the Allies in the Balkans in the second year of the World War. Briand once again became Prime Minister, in which post he headed the French delegation to the disarmament conference in Washington in 1921. In the next year he retired to private life, but again and again he accepted the summons to duty. In 1925 he headed the French delegation to the Locarno Conference. In 1929 he was again Premier for a few months, and in 1930 was a delegate to the disarmament conference.



Photo U & U

ARISTIDE BRIAND

BRIBERY, *bri' bur ie*, the giving or offering of something of value to one who in return violates his duty or the law in order to benefit the giver. In the eyes of the law, the giver and receiver of a bribe are equally guilty. The gift, to constitute a bribe, need not consist of money, but may take the form of property, or position, or undue influence. Large fines and sometimes long terms of imprisonment are the punishments inflicted on those convicted.

BRICK AND BRICK-LAYING. The story of brick carries one back to days of the greatest antiquity. The most familiar early reference to brick-making relates to the struggle of the captive Israelites in Egypt, over 1,700 years before the birth of Christ. According to Biblical history, this was their principal employment. There was a plentiful supply of clay and sand on the banks of the Nile, also water with which to mix them, and the intense heat of the sun to bake the bricks. When the captives clamored for straw, it was not for burning the bricks, but to chop up and use as a binding material in the same way that horsehair is used in modern plaster. The Egyptian bricks were all sun-dried, not kiln-burned, and thus are similar to the old adobe houses of Southwestern United States and Mexico.

Brick was probably the first material used for buildings of a permanent nature. The art of brick-making was well known in Babylonia over 6,000 years ago; the ruins of great Babylon are a mass of what were once sun-dried bricks. Bricks were the local building material, for the people had no trees for lumber or quarries of stone. The Chinese employed bricks for building many centuries before the Christian Era. The Romans introduced the industry into Britain and other conquered territories. At the present time, bricks exist in England stamped with the initials of Roman brick-makers during Roman occupation of the island.

The first brick building in America was built in 1633 on Manhattan Island, with material imported from Holland. At the present time, wherever there is suitable clay and building is to be done, there springs up a brick-making industry.

Brick-Making. The first necessity in the making of good bricks is a clay free from fossil remains and containing little iron or lime. If sand is not already present in the clay in the proportion of one part of sand to two of clay, sufficient sand must be added to secure these proportions. The clay and sand are first mixed into a pliable mass by the addition of water. From this mass, the bricks may be molded by hand, or they may be molded and cut by machinery. There are now in general use machines which will make over one hundred thousand bricks a day. From the trough in which the sand and clay are mixed, the

material is forced through tunnel-like openings the size of the required brick. As the column of clay comes from the machine, like meat from a mincing machine, it is cut into proper lengths by wires.

The pieces drop on endless belts, on which they are carried to drying sheds. After the bricks are dried, they must be hardened by burning. This is done in kilns, in which the bricks are stacked so that the heat of a fire may readily penetrate to all of them. Kilns are of various sizes, the average being about thirty feet in diameter and twelve feet in height. The firing takes from six to ten days. Bricks for ordinary building are kept at a cherry-red heat; those intended for finer purposes are raised almost to white heat.

Varieties of Brick. In addition to those used for building purposes, *pavement* bricks are made in great quantities. To make these hard enough to withstand the wear of heavy traffic, lime is added to the clay and sand. During the burning, the lime fuses and renders the bricks extremely firm and durable. The introduction of steel frames into buildings has greatly increased the use of bricks. In parts that are not seen, where strength only is needed and finish is not a matter of importance, a brick of somewhat rough appearance is used. *Facing bricks*, or those which occupy prominent, exposed positions, are more elaborately finished, more uniform in color, and sometimes they are glazed by a special process. Bricks are also used for foundations, for linings of sewers, tunnels, chimneys, cisterns, and for numerous other purposes. Tiles and pipes baked in the same way as bricks are extensively used for drainage purposes. Enameled tiles are also used for decorative purposes—for floors, for fireplaces, and for fancy wall linings and wainscots.

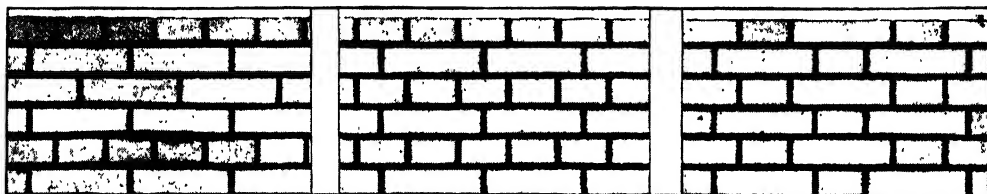
Brick-Making Industry. The great centers of this industry in the United States are along the Hudson River from Troy to New York City; in Philadelphia County, Pa., and in Cook



BRICK-MAKING IN ANCIENT EGYPT

County, Ill. However, brick-making is very widespread, and the output is rapidly increasing. About ten billion common and face brick are made yearly in the United States.

Brick-Laying. Bricks are laid in horizontal rows called *courses*, and are held together by a lime mortar. The latter also gives elasticity to



HOW BRICKS ARE LAID

The three styles pictured are, from left to right, American, English, and Flemish bonds. If brick walls were built entirely of *stretchers*, or bricks whose long sides appear on the outer edge, they would not be strong. If the inner and outer rows are bonded with *headers*, the weight upon any point is borne partly by each row.

a wall, and makes it dryer. For the sake of strength, the weight of each brick should be borne by more than one in the course below; therefore no vertical joint is permitted directly over another. On the other hand, a pleasing appearance is gained by having every joint in line with one in the second course below it. Bricks in America are usually eight inches long, four inches wide, and two inches thick; in England they are slightly larger. The ancient Roman brick, sometimes copied to-day for architectural reasons, were twelve inches long and less than two inches thick.

Brick walls are of several sorts—solid, hollow, veneer, and curtain. A solid wall is from one to three feet thick, according to the weight it must bear. Hollow walls give coolness in summer and warmth in winter, and they keep out moisture, but are expensive. Brick veneer four inches thick is built around wooden buildings to improve their appearance; the veneer should be separated from the wood by an air space. Curtain walls are those in steel or concrete skeletons; they carry no weight but their own.

Related Subjects. The reader is referred in these volumes to the following articles

Adobe
Arch

Bridge
Building

BRIDAL VEIL FALLS. See YOSEMITE NATIONAL PARK.

BRIDAL WREATH, a small, graceful, flowering shrub of the rose family, common in



Photo Visual Education Service

BRIDAL WREATH

gardens or on lawns in north temperate regions. The branches are slender and curving; the

leaves are smooth, small, and oblong, sometimes having cut edges. In spring, especially, there is a great profusion of small, rounded clusters of dainty white flowers. The willowy blossoming branches of the bridal wreath make attractive decoration. See SPIRAEA. B.M.D.

Scientific Name. The bridal wreath belongs to the family *Rosaceae*. Its botanical name, *Spiraea prunifolia*, means *plum-leaved spiraea*.

BRIDGE, a game of cards played with the full pack of fifty-two cards, and usually by four people. It is derived from whist, and was formerly called bridge whist. The game is of uncertain origin; similar games were played a century ago in Russia, Turkey, and Denmark, but its popularity dates from 1894 and 1895, when it was introduced in London. Since then various new rules and styles of play have been made from time to time. The most important of these variations is the game of *auction bridge*, whose popularity has been steadily increasing since its introduction in 1907. It has now completely supplanted ordinary bridge in public favor.

Both in regular bridge and in auction bridge, the tendency at first was to adhere rigidly to certain rules, but as the game developed, greater freedom was allowed to the players. Bridge, however, is still an exacting game, and no beginner can expect to master it easily. Power of concentration and a retentive memory are required to a considerable degree, but the best equipment of the bridge player is experience. Practice is the best teacher, but the beginner is advised also to accept advice from better players and to consult at least one of the standard books of rules.

Auction Bridge. In auction bridge, which is now played almost to the total exclusion of the earlier form, the method of play is the same. The dealer, however, instead of making a declaration, is allowed to bid for that privilege, and each of the other players, in turn, may make a higher bid. The bidding continues until three of the players in succession have refused to bid further. The player who contracts to take the largest number of tricks of the highest value is given the privilege of playing the hand; provided, however, that as between partners who have bid on the same

suit, the player who first made such a declaration shall play the hand. His partner becomes the *dummy*, as in regular bridge (see below).

The value of a bid depends on the value of a trick "in trumps" or in the suit. Under the present rules, the tricks count as follows: if clubs are trumps, each trick over six counts six; if diamonds, seven; if hearts, eight; if spades, nine; if no trumps, ten. In the bidding, therefore, a bid of "one heart" is higher than one diamond, but a bid of "two diamonds" (fourteen points) is higher than "one heart" (eight points). Any bid for a higher number of tricks takes precedence, even though the value of the bid is the same; for example, "four clubs" (twenty-four) is better than "three hearts" (also twenty-four). A bid of one heart signifies that the bidder, if the bid is not raised, makes hearts trumps, and he undertakes to win one trick more than six. If he is successful, he scores not merely what he bid, but all he makes; for example, if he bids one heart and takes ten tricks, or four more than six, he scores four times eight, or thirty-two. If he fails to fulfil his contract, the opposing side adds fifty points to its honor score for each trick which the declarer loses. For example, if the declarer bids "two hearts", he undertakes two more than six, or eight, tricks; if he succeeds in taking only six tricks in all, he has taken two less than his contract, and the opponents add twice fifty, or 100, points to their honor score. The additions to the game score are made only when the side which has declared the trump has fulfilled its contract.

The *honor* score is more complicated than in whist. If the declaration is "no trumps," the four aces are the *honors*, and for each ace held at the beginning of play the side holding it counts ten, provided that it holds at least three of the aces. If each side has two aces, the honors are *divided*, or *easy*, and are not counted. If one of the players holds the four aces in his hand, his side is credited 100 points in the honor score. If a trump has been declared, the honor cards are the ace, king, queen, jack (or knave), and ten, the value of the honors being determined on the basis of ten:

Three honors, either divided or in one hand, three 10's, or 30

Four honors, divided, four times 10, a credit of 40.

Four honors, in one hand, eight times 10, or 80

Five honors, three in one hand and two in the other, five times 10, or 50

Five honors, four in one hand and one in the other; nine times 10, or 90

Five honors, in one hand, ten times 10, or a credit of 100

For example, if a player holds the ace, king, and ten of diamonds, when diamonds are trumps, he adds three times 10, or 30, to his honor score. If hearts are trumps and he has three honors, he adds the same sum, 30,

to the honor score. (Rules adopted in 1926.)

Slam. When one side takes all thirteen tricks, it counts as a *grand slam*, for which 100 points should be added to the honor score. If one side takes twelve tricks, it counts as a *little slam*, for which 50 points should be added.

Rubber. The side winning the rubber adds 250 to its honor score. When rubbers are not played, game counts 125.

Doubling. Either opponent of the dealer and his partner may *double*, which means that each trick shall have double its usual value. It signifies, of course, that he believes that he can prevent the dealer from taking as many as the declared number of tricks. The dealer or his partner may *redouble*, in which case each trick counts four times its usual value. It is optional to limit the value of a trick to 100. Doubling does not affect the value of honors, grand slam, or little slam.

Contract Bridge. This variety of auction bridge has been popular in Europe for a good many years, but has been commonly known in America only since 1927. In the main, the laws of auction bridge govern contract auction, but the scoring and bidding adopted for the latter are different. Contract bridge is so called because the declarer scores in the trick column only the number of tricks named in his contract (whether undoubled, doubled, or redoubled). Tricks made in excess of his contract are scored in the honor score of his side.

As in regular auction, thirty points in the trick score are required for game. The winner of any game, whether first, second, or third, scores a bonus of 200 points in the honor score. As in regular auction, when one side has won two games, the rubber is completed. The side which has won two games scores a bonus of 300 points in its honor score, in addition to the bonuses for each of the two games it has won.

The honor values are as follows: in a trump declaration, four honors in one hand, 100; five honors in one hand, 150; in no trump, four aces in one hand, 150.

A side that has won a game on the rubber is said to be *vulnerable*. When a vulnerable side assumes the contract, all penalty and bonus points are increased. A side having no game on the rubber is said to be *invulnerable*. When both sides are vulnerable, penalty and bonus points are increased for both sides.

Regular Bridge. The play in bridge is similar to that in whist, except that the dealer or his partner must declare the trump. The dealer may declare any suit to be trump, or he may prefer to play without trumps. If he feels that his own hand does not permit a satisfactory declaration, he may ask his partner to declare the trump. This is called the "bridge," or "bridging the declaration," and the dealer usually signifies his intention by

saying, "I bridge it." In any case, the dealer plays the hand without assistance from his partner; the latter, after the player to the dealer's left has led the first card, lays his cards, arranged by suits, face up on the table. The dealer makes all plays from his own and his partner's hand, the latter being known as the *dummy*. Partners always sit opposite each other, and the order of play is from left to right, the player to the left of the dealer having the first lead. Thereafter the winner of each trick leads.

Scoring. The method of scoring is somewhat complicated. The score is kept in two parts, the *game* score and the *honor* score. The game score is determined entirely by the number of tricks taken by the dealer; the honor score includes special amounts for high cards held at the beginning of play, and certain special penalties and special rewards. These two scores, though kept separately, are added together at the conclusion of play.

The *game* consists of thirty points. Points for game are credited only to the side making the declaration. This side wins a certain number of points for each trick over six, as follows: if "no trumps" is the declaration, each trick over six counts twelve points; if hearts, eight points; if diamonds, six points; if clubs, four points; if spades, two points. Every hand must be played out, and if the declarer makes more than thirty points the total is credited to his score. The winner of two games out of three wins a *rubber*. If one side wins two games in succession, the third game of the rubber is not played. The honor score is the same as in auction bridge (see above).

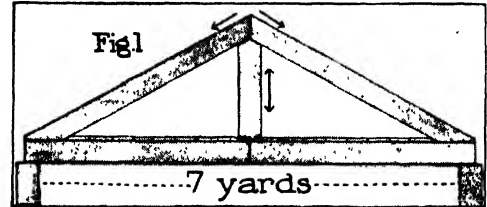
Other Varieties. Bridge, either regular or auction, may also be played by two or three people. In every case, however, four hands are dealt. In two-handed bridge, or double-dummy, each player plays two hands, his own and his dummy's. In three-handed bridge, the players alternate in playing with the dummy, but in three-handed auction, they bid for the privilege, and the two unsuccessful bidders become partners for that deal. Points are scored in the same way as in the other forms, but in three-handed bridge, each player has an individual score. B.M.W.

BRIDGE. Nature built the first bridges—logs fallen over streams, giant grapevines growing across ravines, or arches of rock carved by the wind and rain. (See the article NATURAL BRIDGE for pictures.) Timber foot-crossings were probably the first made by man, though possibly suspension bridges of the grapevine type, such as those constructed in modern times by the Indians of British Columbia and other primitive peoples, are even older.

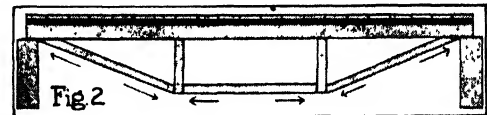
The Romans were the first great bridge builders. Besides braced timber structures like that defended by Horatius, they constructed

magnificent arches of stone, some of which remain in use to this day (see AQUEDUCT). After the fall of Rome, little progress was made until the era of iron and steel, though the length of both timber and arch bridges was increased.

Timber Bridges. The simplest form of timber bridge, a log or plank with one end on

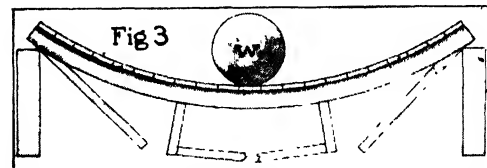


each bank of a stream, is of course limited in span (the distance between the points of its support) by the length of the log or plank. Moreover, everyone has noticed, in crossing such a plank bridge, that it bends more and more as the center is approached; the longer the span, the weaker the bridge. This is because each point of support acts as the



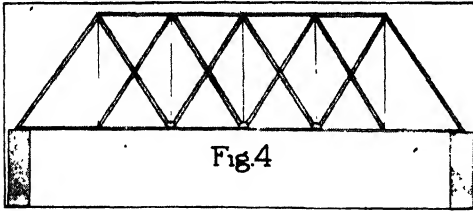
fulcrum of a lever (which see). It is obvious, then, that to lengthen or to strengthen a wooden bridge, it is necessary to have central points of support. But the stream or valley may be too deep for a pier, or the current may be too swift for one to be built with ease. In such case, added support must be a part of the structure itself.

In an ordinary wagon bridge, such as that represented in Fig. 1, the strength, of course,



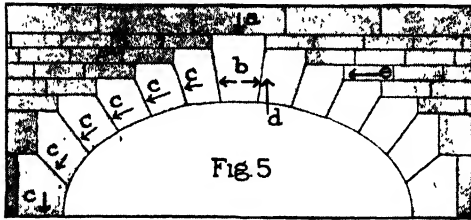
depends not on the planks but upon the framework which supports them. If the stream to be crossed is seven yards wide, a frame of timbers unsupported except at the ends would perhaps break under heavy loads. In the simple truss shown in Fig. 1, any weight upon the bridge exerts a downward pull upon the post at the center, which in turn distributes the load between the two slanting supports in an outward thrust upon the foundations. The post is said to be subject to *tension*, or stretching, and the slanting supports to *compression*, or squeezing. It will be shown later that the horizontal timbers are subject to both tension

and compression. In Fig 1, the span of seven yards has been safely bridged with timbers, none of which is over four yards in length. The exact strain which each one will be called



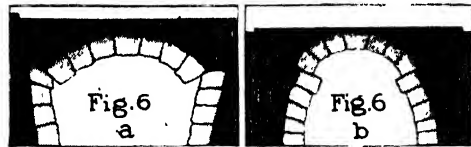
upon to bear under a given load can be accurately determined (see COMPOSITION OF FORCES).

In many bridges, the truss is underneath the roadway, as in Fig. 2. Here the upright posts are subject to compression, and the horizontal and two diagonal braces to tension.



That this is so can be seen from Fig. 3, which shows that if a weight is placed on the bridge heavy enough to bend it, the distance between the points connected by the truss timbers is increased. Too heavy a load will destroy the bridge.

By the construction of more elaborate trusses, timber bridges may be greatly extended

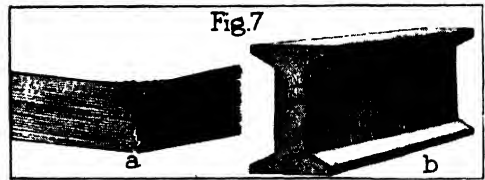


in length. One erected at Wittingen, Germany, in the eighteenth century, had a span of 300 feet, probably the longest in any wooden bridge. A truss frequently seen on timber

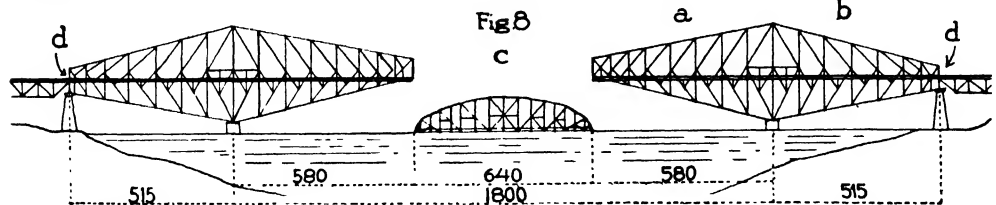
bridges is the Howe truss, shown in Fig. 4, in which the diagonals are of timber and the vertical tie-rods (so called because they tie together the parts which weight tends to pull apart) are of iron.

Wooden bridges have the great disadvantage of being rapidly worn by weather, and easily burned. They are employed only when those made of other materials would be too expensive. Railroad *trestles*, bridges of many small spans which cross valleys, are frequently built of wood, and seldom resist first evidences of decay for more than fifteen or twenty years.

Arch Bridges. A century and a half ago the only bridge materials other than wood were stone and brick. They were employed



in the arch form, which has been a favorite from very ancient times. Figs. 5 and 6 illustrate the points of weakness and strength in this type of bridge. The weight of the *key-stone* (the central stone crowning the arch) exerts a downward pull, represented in Fig. 5 by the arrow *a*. But in effect, this pull is resolved into thrusts against each of the next stones, called *voussoirs* (see COMPOSITION OF FORCES). The *voussoirs*, in turn, thrust against their neighbors until in the *skewback*, the lowest stone, the force is exerted directly downward (see ARCH). It is a law of physics that when bodies are in equilibrium there is an equal and opposite force for every force exerted by them or upon them. Thus, when an arch is properly built, the downward element of the thrust *b* is exactly equaled by the upward thrust *d* of the *voussoir*, and the outward thrust of a *voussoir* is counterbalanced by the inward thrust *e* of the pier. If an arch is too broad, its top too heavy, or the piers too light, it will break, as shown in Fig. 6a, because of the excessive outward thrust. If, on the other hand, an arch is too light at the top, or too heavy at the sides, the upward thrust will be



THE GREAT CANTILEVER BRIDGE AT QUEBEC

It was the central portion of the 1,800-foot span, itself 640 feet in length, which collapsed in 1916. In the illustration the center section is shown not yet lifted into position.

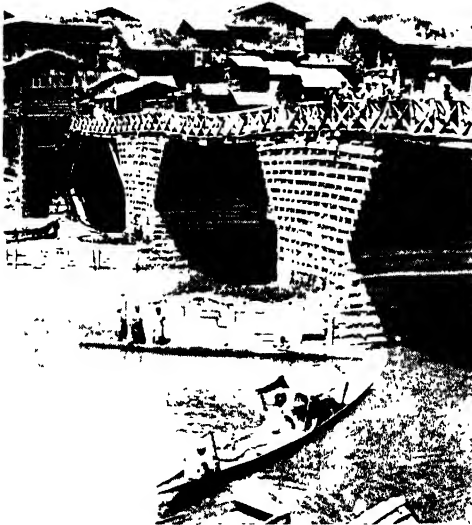


MANHATTAN BRIDGE, NEW YORK CITY

One of the newer of the suspension bridges connecting Manhattan Island with the Borough of Brooklyn and New York suburbs on Long Island

too powerful, and the result will be as illustrated in Fig. 6b.

The Romans did not build arches of more than one hundred feet span, but modern engineers have learned to construct them nearly three times as long with stones, and even



IN FAR-AWAY INDIA

Photo U & U

A fine example of primitive bridge construction in Kashmir

longer with concrete. A stone arch bridge at Plauen, Germany, has a span of 295.3 feet, and a concrete bridge in Rome, Italy, a span of 328 feet. The principles of the arch bridge combined with the truss are seen in some iron bridges, instances of which are the cast-steel

Eads Bridge (which see) over the Mississippi at Saint Louis, Mo. (520 feet span), the beautiful wrought-steel bridge over the upper Niagara between the United States and Canada (840 feet span), and the Hell Gate Bridge at New York, with the remarkable span of 1,016 feet (see HELL GATE, for illustration).

Perhaps the usual reason for the choice of the arch form of construction is its beauty, which is well illustrated in the accompanying picture of the Tunkhannock viaduct.

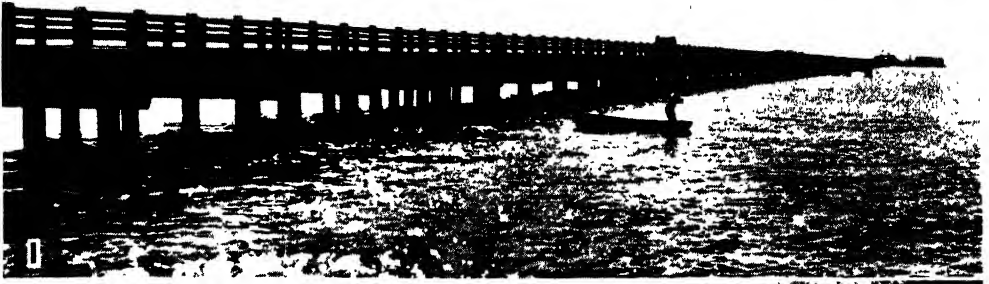
Iron Beam and Truss Bridges. The iron beam bridge is an evolution of the simple



OVER THE FIRTH OF FORTH

In this graceful cantilever bridge are two spans of 1,710 feet. From 1880 until the completion of the Quebec Bridge these were the longest spans in any structure in the world.

log bridge. Fig. 7a shows what takes place when a wooden beam bends beneath weight. The upper fibers are crushed together, and the lower ones pulled apart; that is, the beam is subject to both compression and tension. The intensity of the forces is least near the



Photos. P & A; Wide World

A Variety of Bridges. (1) Gandy Bridge, between Tampa and Saint Petersburg, Fla. (2) A traffic bridge eight centuries old, connecting two French towns. (3) A corduroy bridge in Ceylon. (4) Bridge of Alexander III, Paris. (5) A span in Southern Idaho, 470 feet above the water, formerly the highest bridge in the world. (6) A bridge near Minneapolis, nearly a mile in length, the longest concrete structure in the world.

center and greatest at the edges, hence the usual steel beam, shown in Fig. 7*b*, is made stronger at top and bottom. From its shape, it is called an I-beam. Steel beam bridges are suitable for railway spans of not more than twenty-five feet, and for roadway spans of less than forty feet.

The iron truss bridge is constructed on the same principles as the wooden truss, but with much greater variety of design to suit its par-



TUNKHANNOCK VIADUCT

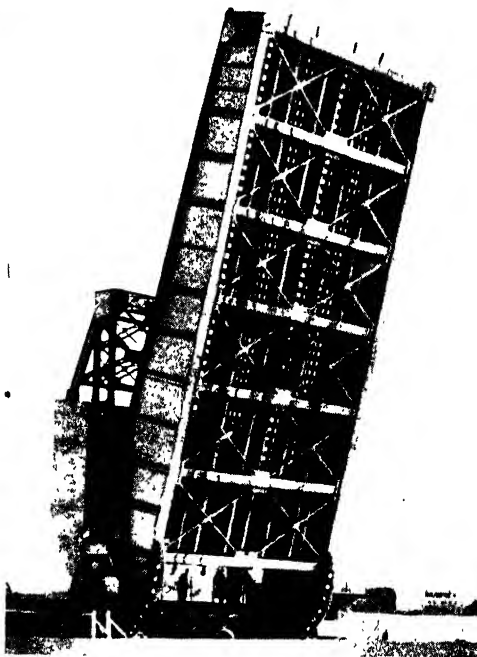
A great concrete and steel structure, on the Lackawanna Railroad, in Pennsylvania. It is a half mile long, is 240 feet high, and cost \$12,000,000. This vast expenditure was undertaken to shorten the running distance between New York City and Buffalo three and one-half miles and reduce heavy grades

ticular purpose. In the Saint Louis Municipal Bridge, a simple truss has a span of 668 feet, and the central section of the Quebec Bridge (Fig. 8) is a simple truss of 640 feet length.

Suspension Bridges. A short time before the year 1800 a form of bridge hung on chains or wire cables was found to be strong enough for long spans. The suspension bridge has the merit of being less expensive than other long bridges, and can be made an object of great beauty, as the accompanying picture of the Manhattan Bridge shows. But its great fault is its flexibility; it sways with every wind, and a regiment marching over it with uniform step would cause it to swing so violently that it would collapse. An army could cross in perfect safety to structure and men, if the step were broken and each person walked at will. The prominent steel work at the roadway of the Manhattan Bridge is merely stiffening and wind-bracing; the whole support of the structure comes from the four steel cables that pass over the high towers. These cables were spun by drawing a steel wire back and forth across the river, over the towers; each cable has a diameter of about 21 1/4 inches, is composed of 2,368 wires, and fastened to anchorages at both ends. One of the longest suspension bridges is the Williamsburg Bridge, which crosses the East River of New York with a span of 1,600 feet. The Delaware River Bridge connecting Philadelphia and Camden,

N. J., is even longer, having a span of 1,750 feet. The first great suspension structure was the Brooklyn Bridge; it developed engineering skill which evoked the admiration of the world. This feat was so epoch-making that the Brooklyn Bridge is given special description in these volumes, in its alphabetical order.

Cantilever Bridges. A bracket fastened on the wall to hold a shelf is a cantilever. In the forms of bridge already described, it is plain that if any section were removed the structure would collapse. If in a cantilever bridge, however, the central section were removed, as shown in Fig. 8, the remainder of the bridge would be unharmed. At each of the two piers of the Quebec Bridge an independent truss structure was erected, which is in perfect balance at all times, though the cantilever arm (*a*) extends outward 580 feet from the pier and the anchor arm (*b*) 515 feet. In most cantilever bridges, the central part (*c*)



TYPE OF BASCULE BRIDGE

is built from the cantilever arms, and to offset its weight, which might tip the whole structure inward at the center, the anchor arms are fastened to the anchor piers (*d*).

The great advantage of the cantilever bridge is that it can be erected without temporary supports, which might block the channel, or which otherwise, as in the case of the huge bridge over the Firth of Forth in Scotland, could not be constructed at all because of the

depth of the channel and the swiftness of the current. While this is also true of the suspension bridge, the latter, on account of its tendency to sway, is not strong enough for heavy railroad traffic.

Movable Bridges. Where river bridges cannot have their roadway high enough for boats

to pass beneath them, it is frequently necessary to make them movable. The most usual type of this class of bridge until recently was the swinging draw-bridge, which turns upon a vertical axis, at the center of the stream, like a merry-go-round. Sometimes, however, the central pier necessary for a swinging bridge would occupy space in the stream that is needed for ships. In this case, a *lift* bridge which can be raised like an elevator, or a *bascule* bridge, opening like a jack-knife, has been found to be more suitable.

In both the lift and the bascule bridges, massive counterweights move down when the bridge goes up, so that, like a window and its weights, the whole structure is always balanced and requires approximately little power to move it. In a bascule bridge, the circular swing of the two lever-like halves makes it very difficult to maintain perfect balance in

all positions. Where the stream is narrow, the bridge may not be in two parts, separated at the center, but may be one span, raised from either bank. (See page 954.)

Pontoon Bridges. A bridge built on boats is called a pontoon bridge. It is usually a temporary structure erected by an army. Perhaps the most famous pontoon bridges were those by which the hordes of Xerxes crossed the Hellespont. See PONTON.

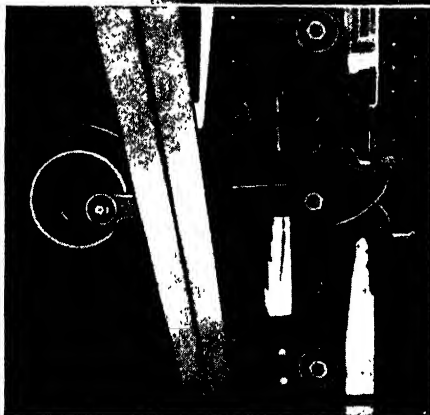
Related Subjects. The reader is referred in these volumes to the following articles

Aqueduct
Arch
Brooklyn Bridge
Composition of Forces

Concrete
Eads, James B.
Hell Gate
Natural Bridge

BRIDGE OF SIGHS, a beautiful bridge in Venice which spans the canal between the Doge's Palace and the state prison. It was

so named because prisoners passed over it from the hall of judgment to the place of execution. It was built in the closing years of the sixteenth century by Antonio Contino, who was also the builder of the famous Rialto Bridge and was therefore known as "Antonio of the Bridge." The Bridge of Sighs is a lofty structure, arched at the top and closed at the sides. It contains two passages; through one, prisoners passed to the palace, and through the other were led back to the prison. (See page 954).



LOCKING MECHANISM OF A BASCULE BRIDGE

It contains two passages; through one, prisoners passed to the palace, and through the other were led back to the prison. (See page 954).

["Bridge of Sighs" is also applied to a covered passage way in New York City between the Tombs prison and the criminal courts building.]

BRIDGE OF TEN THOUSAND AGES. See FU CHAU.

BRIDGEPORT, CONN., one of the county seats of Fairfield County, is fifty-eight miles northeast of New York, on Bridgeport Harbor, a small inlet of Long Island Sound, at the mouth of the Pequonnock River. Two arms of the harbor divide the city into three sections. There are numerous parks, recreation grounds, and ocean drives. A summer resort, Black Rock, is a suburb, and is also located on the harbor. The population of Bridgeport was announced by the Census

Bureau in 1930 as 147,206.

The first settlement was known as Pequonnock, as early as 1665; it was not until 1800 that the town, which was renamed several times, was incorporated as the borough of Bridgeport. In 1836 it was incorporated as a city. The first trip of the Bridgeport steamer, *The Citizen*, in 1832, the construction of the Housatonic Railroad as far as New Milford, in 1840, and the opening of the New York, New Haven & Hartford Railroad in 1848, were mileposts in the development of Bridgeport. To-day the city ranks second only to New Haven in size in the state.

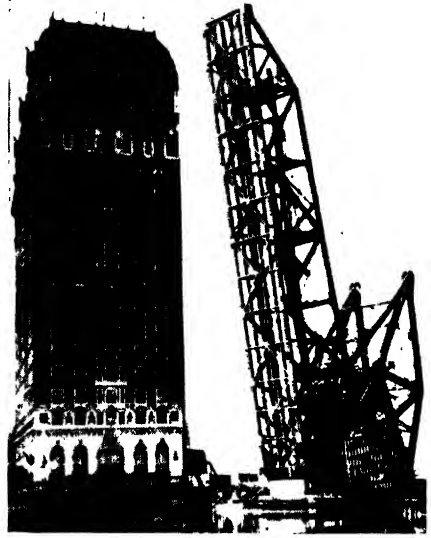
Transportation. The main line of the New York, New Haven & Hartford Railroad and two of its branches furnish Bridgeport with railway service. This is augmented by daily steamboat service, and interurban and motorbus lines.

Industries. There are about 450 industrial establishments, manufacturing 5,000 articles, among which are more than thirty nationally known products; the most important of these are sewing machines, phonographs, machinery, automobiles, arms, and typewriters. Bridgeport, as one of the chief ports of entry in Connecticut, has complete customs facilities. Its domestic water-borne commerce is naturally of importance. There are two distinct harbors, Black Rock and the main harbor, the latter having a depth of twenty-two feet up to the mouth of Pequonnock River.



A RAILROAD BRIDGE IN CHICAGO

At left, it is opening like a jackknife, and at the right has attained its highest elevation. When thus raised, its top is higher than the roof of one of Chicago's great hotels, as shown in the double-printed illustration.



Memorials. Seaside Park, on the shore, with a sea wall and drive two miles long, contains a soldiers' and sailors' monument and monuments erected to the memory of Elias Howe and P. T. Barnum. The in-

Institutions. The Junior College of Connecticut, a state trade school, two private normal schools, and a university preparatory school are located in Bridgeport. The public library system includes a central building and several branches, two of which were built by the Carnegie Corporation.

BRIDGES, *brij' ez*, ROBERT (1844-1930), a scholarly English physician and poet whose name and writings were unknown to the majority of readers until 1913, when he was chosen to succeed Alfred Austin as poet laureate of England (see POET LAUREATE). He distinguished himself as a student at Eton and at Oxford, and after graduation from the university traveled for several years in Europe and the Far East. Following this, he studied at Saint Bartholomew's Hospital in London, and on receiving his degree in medicine began life as a practicing physician, and served also as a member of the staffs of two London hospitals. In 1892 he sought the seclusion of his beautiful rural estate in Berkshire, where thereafter he lived as a student of literature and as a writer of poetry that critics approved. Even after his appointment as poet laureate, he seldom emerged from his semi-retirement.



I stood in Venice, on the Bridge of Sighs,
A palace and a prison on each hand

—BYRON *Childe Harold*

dust and enterprise of these two men were great factors in the development of the city. See HOWE, ELIAS; BARNUM, PHINEAS T.



Photo Brown Bros

ROBERT BRIDGES
Poet laureate of England.

The poetry of Dr. Bridges is characterized by noble serenity, high finish of style, and pure lyric beauty. These qualities make him the poet of the critic and the scholar, but he has never stirred the multitude in the manner of his popular contemporary, Rudyard Kipling, who many people thought would be named laureate instead of Bridges. He has used both the familiar English rhythms and the verse forms of the Greek and Latin poets, always with faultless technique, restraint, and delicacy.

The edition of his poetical works issued by the Oxford University Press greatly increased the number of his readers. In 1920 he published a remarkable book of verse, *The Testament of Beauty*, on which he spent many years. The following stanza from *A Passer-by* is a good example of Dr. Bridges' style:

Whither, O splendid ship, thy white sails crowding,
Leaning across the bosom of the urgent west,
That fearest nor sea rising, nor sky clouding
Whither away, fair rover, and what thy quest?
Ah, soon, when winter has all our vales oppressed,
When skies are cold and misty and hail is hurling,
Wilt thou glide on the blue Pacific, or rest
In a summer haven asleep, thy white sails furling

BRIDGET, *brig' et*, SAINT, the name of two saints of the Roman Catholic Church. The first is a patron saint of Ireland, commonly known as Saint Bride. She was a woman of unusual ability and beauty. Not wishing to marry or be troubled with suitors, she prayed to become ugly. Her prayer was answered, and she went into seclusion in a cell built under a large oak. Here the monastery of Kildare was founded—"the Church of the Oak." Many wonderful stories are woven about this saint. Her feast is celebrated on the day of her death, February 1.

Another Saint Bridget, or more properly, *Brigitta* or *Birgitta*, of Sweden, is the most celebrated saint of the Northern kingdoms. She married and bore eight children, one of whom was afterwards honored as Saint Catherine of Sweden. Saint Brigitta's charitable, saintly life made her widely loved. Her feast is celebrated on October 9. G.W.M.

BRIDGETON, N. J. See NEW JERSEY (back of map).

BRIDGMAN, LAURA DEWEY (1820-1880), a remarkable blind deaf-mute, born at Hanover, N. H., remarkable for her attainments, in spite of disheartening disabilities. At the age of two, a severe illness deprived her of sight, hearing, and speech, and to some extent, also, of smell and taste. Learning of her case, Dr. Samuel G. Howe, of the Perkins Institution for the Blind at Boston, undertook her education when she was eight years old. Never before had an attempt been made to teach one who had been so deprived of her senses. She made rapid progress, however, and learned to read and write, to reason, and to

think well. She also learned to do household work and to sew, both by hand and on the machine. After receiving her education, Miss Bridgman taught in the Perkins Institution. See BLINDNESS (Education of the Blind).

BRIGADE, *brigaid'*, a term applied to a body of troops consisting usually of two regiments, although the term is elastic and is often applied to a unit of four or even more regiments. In the United States, a brigade usually consists of three regiments; it may be composed of cavalry, artillery, or infantry. See ARMY.

Brigadier General. For discussion of the commander of a brigade, see GENERAL.

BRIGAND, *brig' and*. See BANDIT.

BRIGGS, CLARE A. (1875-1930), a cartoonist and the originator of the popular series *The Days of Real Sport*, *Oh Skinny!*, *When a Feller Needs a Friend*, *Friend Wife*, *That Guiltiest Feeling*, *Somebody Is Always Taking the Joy Out of Life*, and *Ain't It a Grand and Glorious Feeling*. These have endeared him to everybody who enjoys representations of the follies and foibles of life, robbed of their sting, and who believes "a smile is worth a guinea in any market."

Briggs was born at Reedsburg, Wis. He first won recognition in 1896 as a newspaper artist while in the employ of the Saint Louis *Globe-Democrat*, and subsequently his creations became a daily feature of newspapers throughout the United States. He became nationally famous as one of the Chicago *Tribune* cartoonists, and a wide demand for his work resulted in an arrangement whereby his cartoons were syndicated.

[One of his *When a Feller Needs a Friend* series appears in these volumes in connection with articles on EDUCATION.]

BRIGHAM YOUNG UNIVERSITY. See UTAH (Education).

BRIGHT, JOHN (1811-1880), an English orator, reformer, and statesman, for nearly half a century "the personification of his country's conscience." Bright was an earnest Quaker, and he made his religion a part of his daily life. There was in him something of the austerity and righteousness of the ancient Hebrew prophets. With Cobden, he fought for free trade when mere suspicion that a man was a free-trader made him unwelcome among "respectable" people. He opposed England's participation in the Crimean War (see CRIMEA), though people called him traitor. During the War of Secession in America, he was one of the solitary figures in England who opposed recognition of the Confederacy. Late in life he opposed Home Rule for Ireland, although his action cost him the friendship of Gladstone, his old leader.

In early life, Bright gave little promise of future greatness. He was born near Rochdale, where his father was a leading cotton manufacturer. Until his thirtieth year, he was only a local leader, and it was not until 1841, after the death of his wife, that he became a national figure. Three days after her death, Richard Cobden came to see him, and appealed to him in the name of his dead wife: "There are thousands of homes in England at this moment where wives, mothers, and children are dying of hunger. Now, when the first paroxysm of your grief is past, I would advise you to come with me, and we will never rest until the Corn Laws are repealed." See CORN LAWS; COBDEN, RICHARD.



Photo Brown Bros.

JOHN BRIGHT

This invitation Bright accepted. He was elected to Parliament in the same year, and in the next two years spoke throughout England and Scotland for free trade. From this time until his death, except for two periods caused by ill health, Bright was one of the conspicuous figures in the House of Commons. Under Gladstone, he was in the Cabinet from 1868 to 1870 as President of the Board of Trade, and from 1873 to 1874, and again from 1880 to 1882, he was Chancellor of the Duchy of Lancaster. He accepted these offices, however, rather to lend the support of his name to Gladstone, and he was glad when the chance came to resign from the routine of office-holding.

BRIGHTON, *bri' ton*, ENGLAND. See ENGLAND (the Cities).

BRIGHT'S DISEASE, OR **NEPHRITIS**, *nefri' tis*, is an inflammation of the kidneys. The name honors Dr. Bright, who described a slowly progressive form of kidney disease in 1827.

Acute Bright's Disease, or **Acute Nephritis**. This is a frequent complication of acute sore throat, diphtheria, scarlet fever, and other infections. It is also caused by poisoning with mercury, lead, arsenic, carbolic acid, and other toxic agents. The outstanding symptom is the presence in the urine of albumin and casts. A person with acute Bright's disease should stay in bed, keep his body warm, and eat a diet that is low in proteins and salt.

Chronic Bright's Disease. The worst form is characterized by considerable albumin and casts in the urine, and by dropsy and anaemia. In this form of the disorder, the person should

live in a warm climate, and should avoid exposure to cold. The diet should be regulated, but enough meat, eggs, and green vegetables should be supplied to keep up the strength and ward off anaemia.

The dry form is characterized by abundance of light-colored urine of low specific gravity, but not much albumin nor many casts. There is slight tendency to dropsy. Night urination is a troublesome symptom.

Patients with this form of Bright's disease can live for many years in reasonably good health, if they will conform to the laws of right living. The diet can be fairly liberal.

Whatever form of Bright's disease afflicts the patient, he should be under medical care, and follow detailed directions as to diet, work, and living conditions generally. W.A.E.

BRIGITTA, *bri ge' tah*, a Scandinavian saint. See BRIDGET, SAINT.

BRIMSTONE, the name applied to a commercial form of sulphur. In order to purify it, which means to free it from foreign matter, it is customary to melt sulphur in a closed vessel and allow it to settle. Then it is poured into cylindrical molds, in which it becomes hard and brittle, and is known in commerce as *roll sulphur*, or *brimstone*. When ground into a fine powder, it becomes the well-known sulphur of commerce. See SULPHUR. T.B.J.

BRISBANE, *briz' bane*, ARTHUR (1864-), an American newspaper man who, as chief editor of daily newspapers owned by William Randolph Hearst, found a wide audience and acquired an influence on the popular mind possessed by few editorial writers. Numerous other papers, whether they approve or condemn his policy, have been led to pattern their editorials after his—making them simple in language, replete with anecdotal illustrations, and printed in short paragraphs.

Brisbane was born in Buffalo, N. Y. He studied for a time in Europe, and in 1882 became a reporter for the *New York Sun*. After serving this paper for a time in London, he became editor successively of the *Evening Sun*, the *World*, and the *Evening Journal*, in New York City, beginning his connection with the last named in 1897. He bought the *Washington Times* in 1917, and the *Milwaukee Evening Wisconsin* in 1918; both of these he sold to William Randolph Hearst in the following year.



Photo U & U

ARTHUR BRISBANE

Many of Brisbane's editorials were published in 1906 as *Editorials from the Hearst Newspapers*. He has also written a biography, *Mary Baker Glover Eddy*. His column entitled *To-day*, consisting of pungent comments on world news, became a feature of all the Hearst daily papers.

BRISBANE, capital city of Queensland (which see).

BRISEIS, *bry se' is*. See **ACHILLES**.

BRISTLES, the stiff, coarse hairs of the hog or the wild boar, especially those which grow on the back. Various kinds of brushes are made of bristles; among other things, the waxed threads used by shoemakers and saddlers are often tipped with them. Though the United States is one of the greatest hog-growing countries of the world, it imports most of its bristles, for those from the well-fed, fat hogs slaughtered in the packing houses are soft and of poor quality. Cases of anthrax, a virulent disease which attacks both man and animals, have been traced to infected brushes brought in from abroad, and the importation of bristles is under careful supervision. See **ANTHRAX**.

BRISTOL, ENGLAND, one of the oldest cities of Great Britain, known to have existed before the Roman invasion in 55 B.C., and a town of considerable importance when William the Conqueror fought the Battle of Hastings (1066). It is situated not far from Bristol Channel, at the junction of two navigable rivers which flow into the Channel, and is sixth in size among the cities of England. Population at last census (1921), 300,000.

Bristol has long been one of the

most important of English ports; from it John Cabot sailed in 1497 on his American voyage. A famous suspension bridge, with one span 676 feet long, the greatest bridge of its kind in the world when it was built, spans one of the streams. There is no one industry of paramount importance; the manufactures are of wide variety. The city is very proud of its home for incurables, built with a gift of over \$5,000,000.

BRISTOL, PA. See **PENNSYLVANIA** (back of map).

BRISTOL, R. I. See **RHODE ISLAND** (back of map).

BRISTOL, TENN. See **TENNESSEE** (back of map).

BRISTOL, VA. See **VIRGINIA** (back of map).

BRISTOL DIAMOND. See **QUARTZ**.

BRITISH AMERICA. This phrase is used with somewhat varying meaning. In its narrow sense, it refers to that portion of North America north of the United States which is British territory, and includes Canada and Newfoundland. More broadly, it includes as well certain other British possessions in North America or close to it, as British Guiana, British Honduras, the Bermuda Islands, the British West Indies, and the Falkland Islands.

[Each of these colonies, commonwealths, or possessions is described under its own title in these volumes; in the article **GREAT BRITAIN** is given a list of all the British outlying territories.]

BRITISH CABINET. See subhead, in article **CABINET**.



BRITISH COLUMBIA. This westernmost province of the Dominion of Canada has been aptly called the "Switzerland of America." Though it has many pleasant valleys, whose fertility is one of its greatest assets, the province is essentially a mountainous region. Almost the entire width of the great Cordilleras, the backbone of the continent, lies within the province, and its area, except the northeast corner, is included in the mountain system.

Area and Population. British Columbia has a total area of 355,855 square miles, nearly one-tenth of the entire Dominion. Until 1912 it was the largest province, but in that year the extension of the boundaries of Ontario

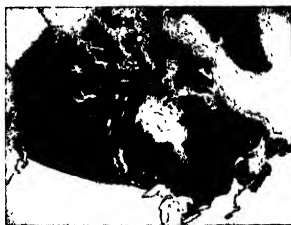
and Quebec placed it third in size.

It has five times the area of the state of Washington, which adjoins it on the south, and about five and one-half times the area of all the New England states. It is nearly 1,000 miles long from north to south, and at its widest part is about 650 miles from east to west.

The population is 591,000, according to an estimate in 1930. Over sixty per cent of the people are male, and a little more than half are urban, that is, they live in cities, towns, and villages. The large cities are Vancouver, Victoria (the capital), New Westminster, Nanaimo, North Vancouver, Nelson, Prince Rupert, and Kamloops.

The People. Of the total population, one-third is of English birth or descent. The Scotch are second, with about one-fifth, and the Irish include one-tenth. There are about 20,000 native Indians: the number of Chinese is about 25,000.

Of the other foreigners or persons of foreign descent, the most numerous are the Scandinavians, Germans, Italians, Japanese, and French, in the order named. The Anglican Church has the



LOCATION MAP
Comparative size with respect to the entire Dominion

largest number of communicants, closely followed by the Presbyterians and the Methodists.

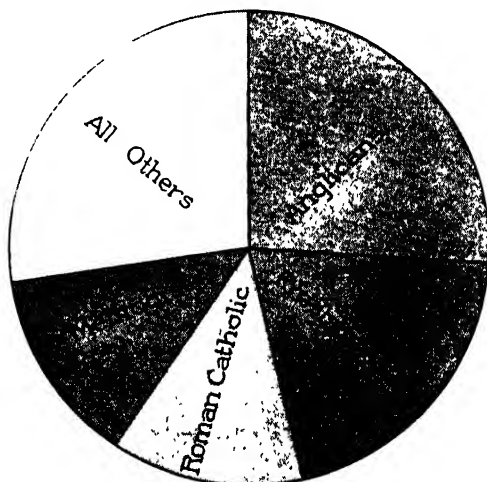
Characteristics of the Surface. The predominating physical feature is the great mountain mass called the Cordillera. This belt of parallel ranges is about 450 miles wide at the southern boundary of the province, and 350 miles wide at the north. The entire mass may be divided into the Rocky Mountains and the Coast Range, between which lies the Great Basin, or Central Plateau. The altitudes vary from 10,000 feet to less than 5,000 feet. Most geographers also speak of the Island Range, which is now almost completely submerged; the only remnants are Vancouver Island and the Queen Charlotte Islands. All of these ranges have a general direction from northwest to southeast. Because of the very irregular shore line, the western line is about 7,000 miles in total length.

Influence of the Mountains on Climate. If British Columbia had no mountains, if it were flat, like Saskatchewan, its climate would probably be nearly uniform in every part. As it is, however, the parallel mountain ranges run at right angles to the prevailing winds from the west. This makes a marked difference in the climate of the east and west, and creates a number of longitudinal zones.

The climate of the coast is like that of Western Europe. The prevailing westerly winds are warm, and are loaded with moisture absorbed in their passage over the ocean. When they strike the cool summits of the Coast Range, condensation of the moisture takes place rapidly, causing a large amount of rainfall. The average annual rainfall is from eighty to ninety inches, about the same as that of Southern England. At Victoria, which is farther north than the city of Quebec, where the cold becomes intense, the temperature during January very seldom falls to the freezing point, and flowers often bloom in the gardens all the year.

After the warm winds have lost most of their moisture and have become cooled, they rise to a height of 7,000 to 9,000 feet to cross the Coast Range. As they pass over the valleys and the great Central Plateau, they are kept at this height by the warm currents rising from the plains. Because there is no obstruction in the path of the winds, nothing to cause them to lose their remaining moisture, the interior has little rain in summer and only light snow in winter. Droughts and extremes of heat and cold are common; the temperature varies from 100° down to -30°.

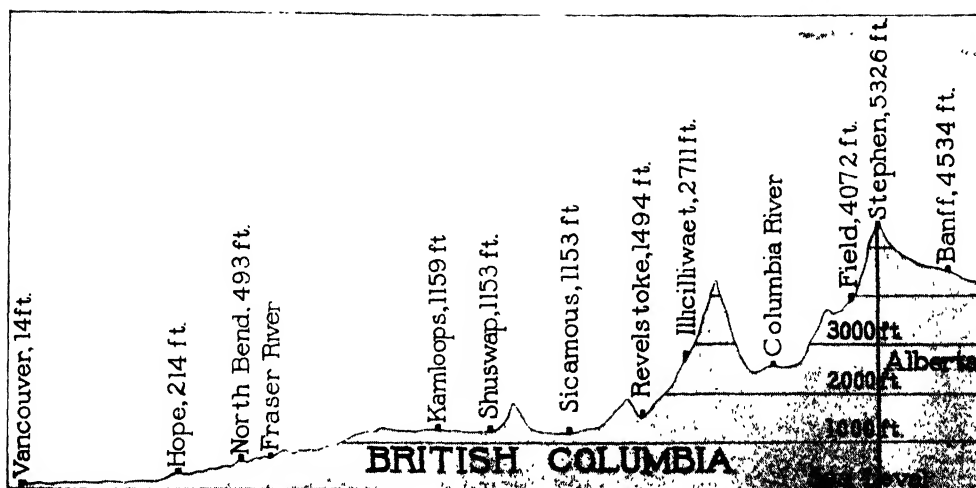
Plant and Animal Life. The wild life of British Columbia is not extremely varied, and all of it belongs to the type called northern or northwestern. Wherever there is rain, there is abundant vegetation, from mosses to



RELIGIONS IN THE PROVINCE

great forests. The western slopes of the Coast Range, the Selkirk, and the Gold Range constitute probably the greatest areas of virgin timber in North America. It is estimated that British Columbia has 92,000,000 acres of forest land, of which 33,000,000 acres carry commercial timber. A large area has been set aside by the Dominion government for National Forest Reserves. There are fourteen such reserves in the province, in addition to the provincial reserves, which occupy almost 5,000,000 acres. The province has about seventy-two per cent of the saw material of Canada, and about one-third of the total forest products of the Dominion.

The Douglas fir, a magnificent tree which frequently exceeds a height of 300 feet, is the most valuable and most abundant species, but white and yellow cedar are also important. On the mainland, directly north of Queen Charlotte Sound, are great stands of spruce and hemlock, which are especially valuable for making wood pulp.



ELEVATION OF THE LAND, ACROSS THE PROVINCE
On the line of the Canadian Pacific Railroad.

Among the animals, the moose, black-tailed deer, and caribou are common in the valleys and wooded sections; the wapiti, once numerous, is now extinct except in the foothills of the Rocky Mountains. Bears, wolves, and wild cats are so common that in some sections they are considered a nuisance. In the mountains are the haunts of the bighorn and the goat, the pursuit of which furnishes thrills for even the most seasoned hunters. In the north are many fur-bearing animals.

Mineral Wealth and Mining. The coal deposits on Vancouver Island and the gold along the Fraser River first drew attention to the section which now forms British Columbia, and mining is an industry of great importance. The annual output of minerals fluctuates considerably, but \$50,000,000 is a fair average.

As early as 1857, placer mining was carried on along the Fraser River, and by 1863 the annual output had reached \$3,000,000. The production then slowly declined until it was about \$400,000, but new hydraulic methods and new gold fields have revived the industry. The placer mines are of comparatively little importance, but lode mining brings the annual total to an average of close to \$5,000,000.

In the southeastern part of the province are large deposits of silver-lead ores, and the production of each of these minerals averages \$24,000,000 a year. Copper has been mined commercially only since 1894; it now averages 70,000,000 to 90,000,000 pounds per year.

Of the non-metallic minerals, coal is most important. It is mined chiefly on Vancouver Island, in the Fernie district (in the southeast), and in various other parts of the south third of the province. In the production of coal, British Columbia is second to Nova Scotia among the provinces, but its annual average of

2,200,000 short tons is less than half that of the province on the other side of the continent.

Fisheries. For many years, Nova Scotia held first rank among the provinces for its fisheries, but by 1912 British Columbia had forged ahead; the fisheries of this province are now the most important in Canada, and yield about fifty per cent of the annual total for the Dominion. The salmon fisheries are by far the most valuable, and their products, including canned fish, form a large percentage of the total proceeds of the fishing industry.

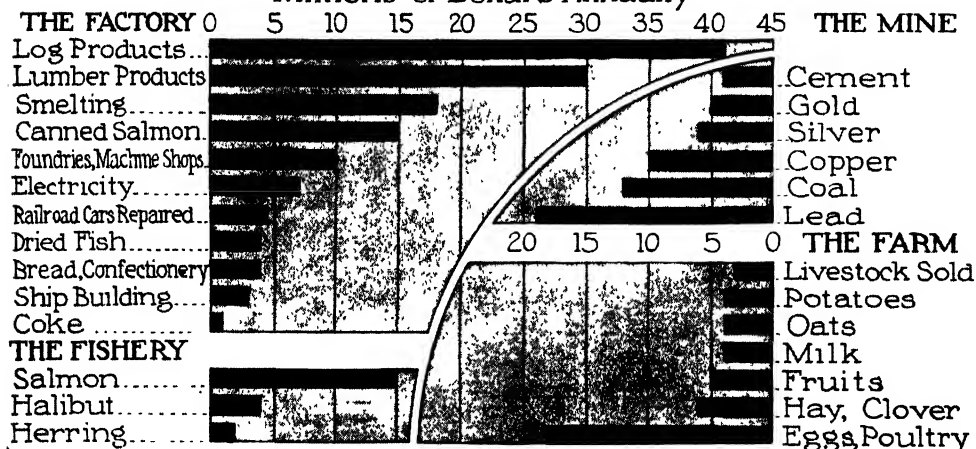
Seventy-five per cent of the catch is canned each year. The spring salmon, or quinnat, is the largest, and the best for use when fresh, in the spring. The sockeye, which follows in the summer, is smaller, though of more uniform size. When the salmon come up the rivers to spawn, they are so numerous that some of the streams are almost choked with the multitude of fish. About two-thirds of the canneries are on the Fraser River.

The only other fish of much importance is halibut.

Agriculture. Lumbering and fishing are the greatest industries, but not the only ones. There are many fertile sections where grains and other field crops are being successfully raised, and the lower valley of the Fraser River is one of the regions where fruits and vegetables of all kinds reward the farmer's work. Practically all of the valleys are fertile, and require only irrigation to make them productive. In the Okanagan, Thompson, and Columbia valleys are more than 100,000 acres tributary to irrigating canals, and there are several hundred thousand more acres available. The irrigated land will support many kinds of crops, but the expense of constructing irrigation systems is a heavy financial item.

BRITISH COLUMBIA PRODUCTS CHART

Figures Based on Canadian Government Reports
Millions of Dollars Annually



Manufactures. The net production from manufacturing in British Columbia is over \$120,000,000 yearly. More than half of this amount is derived from the manufacture of forest and fish products. British Columbia has fifteen industries in all, but the lumber industry is easily in the lead, with smelting of ores in second position, and fisheries in third place. Meat-packing, fruit-canning, brewing, and ship-building are next in importance, but the combined value of their total production is less than the value of the fishery products.

Vancouver is the center of manufacturing, and alone produces about three-fourths of the total. The many rapid streams which descend the west slope of the Coast Range furnish abundant water power where it is most needed—on or near the coast—and there is no visible reason why the manufacturing industries should not continue to grow.

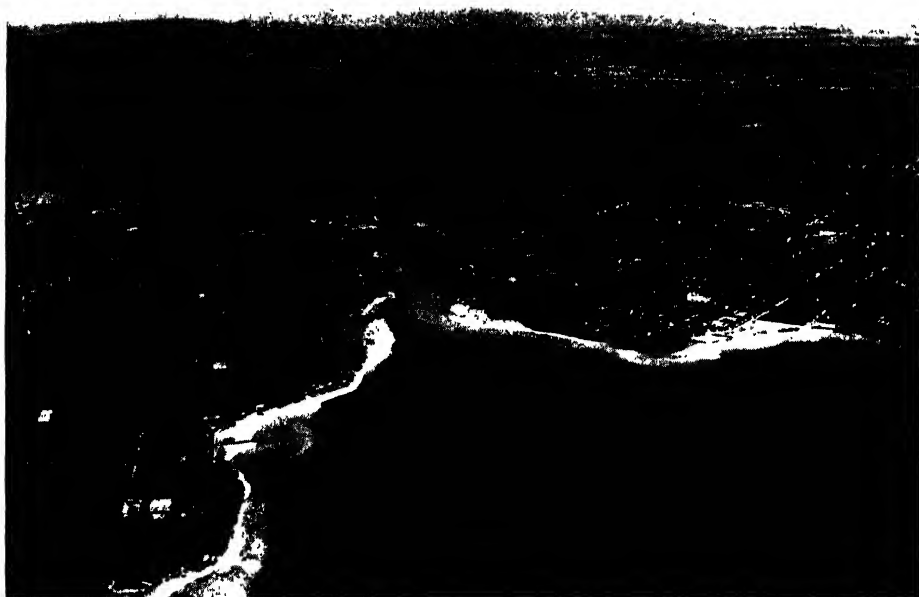
Waterways and Railways. Owing to the mountainous character of a large part of the province, the means of transportation have not yet been fully developed. The construction of wagon roads and even trails is a task involving great skill and expense. The construction of railways is even more costly, but the province is now well served by the great transcontinental lines, the Canadian Pacific and lines of the Canadian National. The total railway mileage is about 4,100.

In the Kootenay district, the steamers on the lakes furnish connections between some of the points not reached by railroads, and on the Fraser River steamers ascend a considerable distance. There is also steamship connection between Vancouver, Victoria, and Prince

Rupert. Most of the interior, however, is dependent on highways and trails, and of each of these there are over 15,000 miles.

Trade and Commerce. The ports of British Columbia—Vancouver, Victoria, Nanaimo, New Westminster, and Prince Rupert—are the natural outlets for Canadian trade with the Far East. To some extent they compete with ports in the United States, not only for Canadian, but for American trade. Vancouver, for example, is 500 miles nearer Yokohama than is San Francisco, and this is no slight advantage. Prince Rupert is 400 miles nearer Japan than is any other port in North America. From Vancouver and Victoria, the Canadian Pacific operates lines of steamships to China, Japan, and Australia. There are a number of lines which operate between the various Pacific ports in Canada and the United States. Several other lines, both Canadian and foreign, operate between British Columbian ports and Alaska, Australia, the Hawaiian Islands, China, and Japan. The foreign commerce of the province amounts to about \$275,000,000 each year, of which less than one-third is imports.

Education. The Ministry, or Executive Council, is also a council of public instruction, and the Prime Minister acts also as Minister of Education. The Council appoints a superintendent of education, who has entire charge of the school system, subject to the approval of the Council. All public schools are free, and no religious instruction or control is permitted. Education is compulsory for all children between the ages of seven and fourteen, with certain exemptions. The present school enrollment is over 100,000, and the number of teachers over 3,000, with about 200 special



Courtesy of Canadian Air Force

Two of British Columbia's Fine Cities. Above, Vancouver and its water front inner harbor.

Below, Victoria and its 961

instructors. There are excellent high schools in the larger towns, and in rural districts high schools may be formed in connection with the public schools whenever ten pupils are qualified to carry on the studies. In 1925 an educational survey of the province was made, which resulted in the establishment of junior high schools. While the idea has not been adopted extensively as yet in the province, this action makes British Columbia a pioneer in the promotion of the junior high school in Canada. There are four technical schools in operation in the province, and two normal schools, at Vancouver and Victoria, respectively.

In 1912 the University of British Columbia received its charter, and in 1915 it began its first session. Its development has been remarkable, and at the end of 1928 it had four faculties and an enrollment of nearly 2,000 students.

The total yearly cost of education in the province is over \$8,000,000, of which amount the province contributes the larger share.

Government. The government is very much like that of the other provinces of the Dominion. The lieutenant governor, who receives an annual salary of \$9,000, is appointed by the Governor-General of the Dominion for a five-year term. He is the direct representative of the Crown. The Ministry, or Executive Council, is composed of six members, including the Premier. Together they hold eleven portfolios. The salary of the Premier is \$9,000, and that of the other Cabinet members, \$7,500. Their appointments are made by the lieutenant governor, but they are responsible to the assembly. The assembly comprises forty-eight members. Six senators and fourteen members of the House of Commons represent British Columbia in the Dominion Parliament at Ottawa.

How British Columbia Entered the Dominion. Until the last quarter of the eighteenth century the existence of the area now included in British Columbia was unknown to the civilized world. The first white men who saw the Pacific coast so far north were Spaniards. In 1778, four years after the Spanish discovery, the famous English navigator, Captain James Cook (which see), began the exploration and accurate description of the coast. In 1788 the first white settlement was made at Nootka, on the west shore of Vancouver Island, by a party of Englishmen, but it was broken up almost immediately by the Spaniards, who claimed by right of discovery the entire coast northward as far as the Russian possessions. For a year or more, it seemed as though Spain and England would go to war over this distant land, but in 1793 they divided the territory by arbitration. Spain took the area south of Nootka Sound, including the present states of Washington and Oregon; England took the

coast northward to the Russian territory, now Alaska.

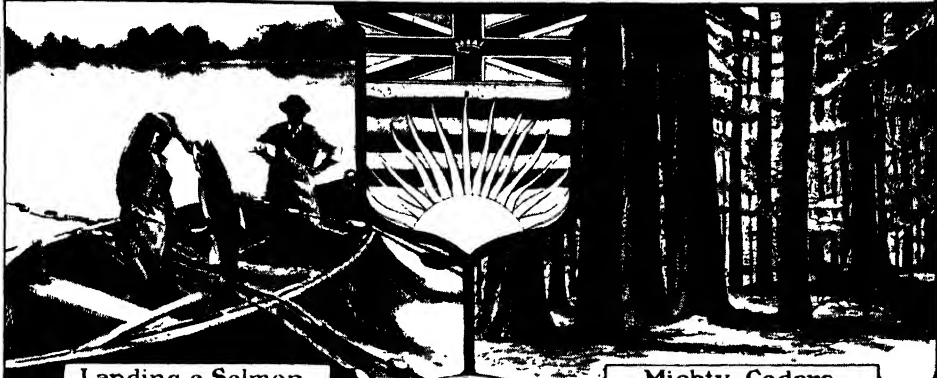
The dispute over ownership had not deterred the British from exploring the territory. Between 1792 and 1794, Captain George Vancouver, under orders from the British government, surveyed the coast about as far north as Milbank Sound. He was the first to circumnavigate the island which is named for him. Meanwhile, other explorers, in the employ of the Northwest Company, had reached the coast after a long and dangerous trip from the interior. The most famous of these men was Sir Alexander Mackenzie, whose achievements are recorded in his biography in these volumes.

Under the Rule of the Hudson's Bay Company. For half a century the great Northwest, including British Columbia, was ruled as the private property of the great fur-trading companies, the Northwest Company until 1821, and thereafter the Hudson's Bay Company (which see). In 1846 the latter built a fort where Victoria now stands. This action created great excitement in the United States, which claimed the entire coast north to the line of 54° 40'. There was a shadow of justice in this claim; it was based on the indefinite character of the boundaries of the Louisiana Purchase (which see). President Polk, though he was elected on the issue of "fifty-four forty or fight," found it wiser to compromise. [For further details, see OREGON (History).]

During these years, the Northwest was constantly growing in population, and the despotic, though just, government of the Hudson's Bay Company gradually became unsuited to new conditions. Vancouver Island was finally created a crown colony in 1850, and the discovery of gold on the Fraser River led to the organization of a separate government for the mainland two years later. The name New Caledonia, by which the region was previously known, was changed to British Columbia. For a number of years, the royal government was more a matter of form than of fact. The governor, both of Vancouver Island and of British Columbia, was Sir James Douglas, who was also chief factor of the Hudson's Bay Company. Douglas was an able administrator, and he is justly regarded as the founder of British Columbia; it is no discredit to his fame to admit that he ruled with an iron hand. In 1866 the rule of the Hudson's Bay Company came to an end, when the two colonies were united under a single government as British Columbia, and five years later it became one of the provinces of the Dominion of Canada.

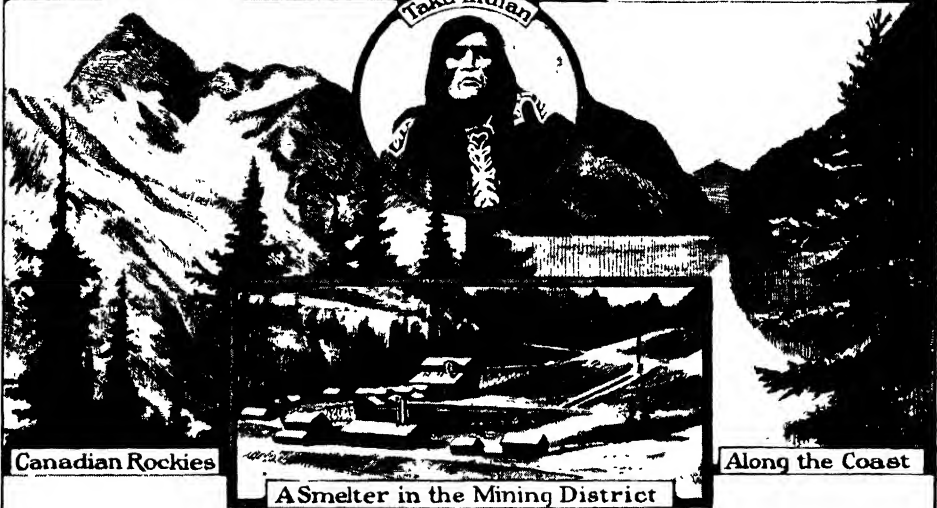
A Province of the Dominion. The adherence of British Columbia to the Dominion was not secured without difficulty. It was argued that the Pacific coast colony could never have interests in common with the eastern prov-

BRITISH COLUMBIA



Landing a Salmon

Mighty Cedars



Canadian Rockies

A Smelter in the Mining District

Along the Coast



Capitol Building, Victoria

QUESTIONS ON BRITISH COLUMBIA

An outline suitable for British Columbia will be found with the article "Province."

What is the nearest Pacific coast port to the Orient?

What have been the immigration troubles of the province?

If you could control one of British Columbia's natural resources, which would you choose?

What section is known as "the Switzerland of America"? Why?

What is a quinnat? A sockeye? For what is each best adapted?

Is Vancouver nearer Japan or farther from it than is San Francisco? How much?

What first attracted white men to this far western region?

What have the Dominion and the provincial governments done to protect the forests?

How does the province rank with other parts of the country in the possession of timber land?

What industry, once of prime importance, is now nearly extinct? Why?

How large a part of the school expenses is met by the provincial government and how much by local communities?

If British Columbia were placed on top of the United States, how large an area would it cover?

How many times as long as the coast line of California is that of British Columbia?

What was meant by the slogan, "Fifty-four forty or fight"?

How large does the most valuable tree of the province grow?

Why are fruits and vegetables the most profitable crops on irrigated land?

What was the British Columbia region originally called?

Are there more males or females in the province?

Is the province more or less densely populated than the Dominion as a whole?

Where do people live on mountain tops which are no longer mountain tops?

If all the people in Canada were removed to this one province, would the density of population be greater or less than that of the United States?

Why is there little danger of Chinamen flocking to the province in great numbers?

Show the close relation between the natural resources and the manufacturing industries.

Why is the snowfall so light in the Central Plateau and so heavy in the mountain region farther east?

How long was it after the coast of Labrador was sighted that this western coast of Canada was first visited by white men?

Why is railroad-building so difficult and so expensive in this province?

inces. Communication between them was slow, and for practical purposes Ottawa was as far from Vancouver as from London. After much discussion, British Columbia voted to join the confederation of provinces, and the Dominion government in return promised to build, or have built, a railroad to connect the Pacific coast with the railways of Ontario. This new railroad, the Canadian Pacific, was not completed until 1885, and more than once British Columbia was all but ready to leave the Dominion, because the agreement had not been kept. But with the driving of the last spike, the province was firmly bound to the Dominion, and the question of separation no longer disturbed the country.

Immigration. This is one of the most vexing problems of British Columbia. Several times it has almost drawn Canada into unpleasant relations with Oriental powers. The

total Oriental population of British Columbia is about 46,000, which is about twelve per cent of the total population. Of this number, 25,000 are Chinese, 19,000 are Japanese, and about 1,100 are East Indians. In 1908 an agreement was made with the Japanese government whereby a limited number of passports would be issued by the Japanese government yearly, and only emigrants bearing such passports would be admitted to Canada. This arrangement has been partially effective, but each year the number of births among the Japanese in British Columbia have exceeded the number of immigrants, and for this reason the Japanese problem is still considered a grievous one in the province.

Chinese immigration was stopped in 1923, when the Chinese Immigration Act was passed; this forbade the entry of Chinese into Canada, other than government representatives, mer-

chants, Chinese children born in Canada, and students.

Hindu immigration has been almost negligible since the clause was inserted in the Canadian Immigration Act in 1910 which forbade the entry of Orientals into Canada, except by direct passage from the land of their birth. As there is no direct steamship line between India and Canada, Hindus have been effectively barred. This action of the Dominion government was hotly resented by the East Indians, and at one time the question threatened to become serious. At the Imperial War Conference of 1918, it was recommended that East Indians already domiciled in other British Dominions be allowed to bring in their wives and minor children. This recommendation was confirmed by Canadian Order in Council in 1919. Since that date, however, few East Indian immigrants have been admitted to Canada.

G.H.L.

Related Subjects. A more detailed knowledge of British Columbia may be gained from the following articles

CITIES AND TOWNS

Vancouver	Victoria
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ISLANDS

Vancouver	Queen Charlotte
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LEADING PRODUCTS

Coal	Lumber
Copper	Oats
Gold	Salmon
Halibut	Silver

MOUNTAINS

Assiniboine, Mount	Rocky Mountains
Cascade Range	Saint Elias Mountains
Robson, Mount	Selkirk Mountains

RIVERS

Columbia	Peace
Fraser	Skeena
Kootenay	

UNCLASSIFIED

Cordillera	Hudson's Bay Company
	Juan de Fuca, Strait of

BRITISH COMMONWEALTH OF NATIONS. See GREAT BRITAIN, BRITISH EMPIRE, AND BRITISH COMMONWEALTH OF NATIONS.

BRITISH EMPIRE, AND BRITISH COMMONWEALTH OF NATIONS. The British possessions encircle the globe, and the welfare of about one-fourth of the world's inhabitants is entrusted to the British government. The nucleus of the great realm under the British flag is Great Britain, known officially as the United Kingdom. British Empire is the name for the entire domain; British Commonwealth of Nations is the modern designation for the United Kingdom and its former chief adjuncts, which, with the exception of Northern Ireland, were recognized in 1926 as practically independent states within the empire. The six states of the Commonwealth of Nations politically equal with the mother country are Canada, Newfoundland, Australia, New Zealand the

Union of South Africa, and the Irish Free State.

Scattered over the world are numerous dependencies administered from London, in some of which, however, there is more or less local self-government.

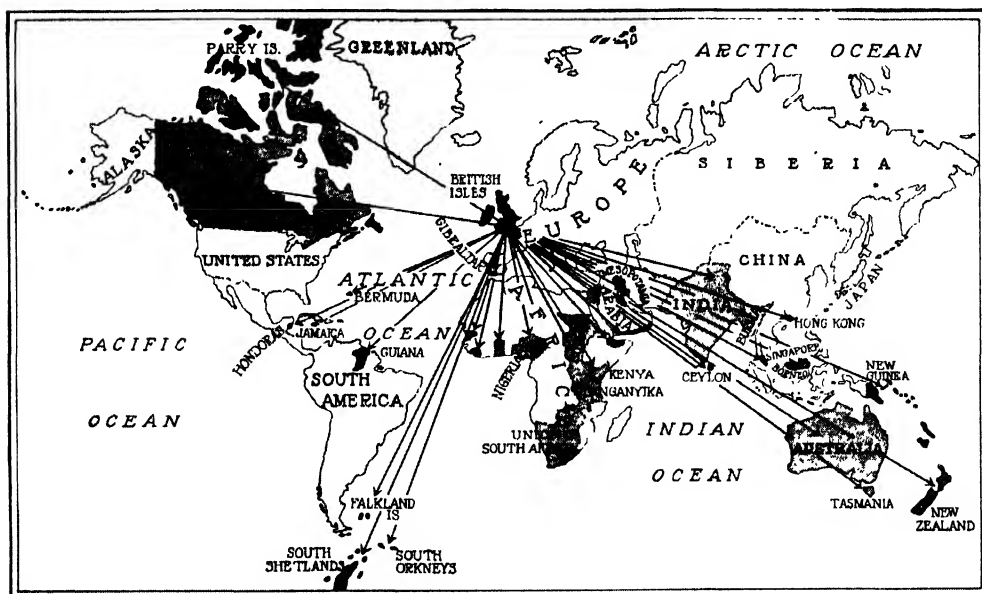
The Peoples and Governments. The contrasts presented by the various parts of this vast, scattered Empire are very sharp. Some of the people who owe allegiance to the British flag are among the most intellectual, highly developed groups in the world; others are rude, primitive peoples but little removed from savagery, and there is adherence to almost every religion and superstition which is known to man.

Various forms of administration have been adopted which are the result of Britain's long experience in dealing with distant dependencies. The English people have made mistakes in government, but they have seldom made the same error twice. It is a matter of pride among the British to know that in nearly all emergencies they have contrived to "muddle through" (this phrase is peculiarly their own). The loss of the thirteen American colonies through the arrogance of a king mad for power impressed a lesson in foreign administration upon succeeding home governments, and from it they have ever since profited. Everywhere under the Empire's flag to-day the people govern themselves to the extent that they show ability in self-rule; where yet the British hand rests heavily in governmental matters, natives slowly are learning control; local potentates are disturbed in their exercise of authority only when the general good demands a curb.

The flexibility of British rule is strikingly shown in the following paragraphs.

Free Dominions. The political status of a considerable part of the world was changed in November, 1926, when the Imperial Conference of member states of the empire, or Commonwealth of Nations, decreed that six dominions, Canada, Newfoundland, Australia, New Zealand, the Union of South Africa, and the Irish Free State, should be permitted to assume practical independence in political action.

The decision was not in the least precipitate; it did not inaugurate an abrupt change in policy, but gave assent to conditions whose approach had been regarded as inevitable for a number of years. Even before the World War, the great dominions had begun to act more and more on their own initiative in matters which had been held as the sole prerogatives of the government of the empire, though not in a spirit antagonistic to the mother country. The action of the Imperial Conference placed the seal of approval on the ambitions of the six dominions, and the momentous act was accomplished as quietly and with as little ostentation as though only a minor ruling were involved.



THE WORLD-ENCIRCLING UNITS OF THE EMPIRE

Never was isle so little, never was sea so lone,
But over the scud and the palm-trees an English flag has flown — KIPLING. *English Flag*.

The Conference made the dominions equal in power with the mother country, yet they declared that they were bound together more closely than ever—in liberty they had found unity. Motherland and dominions were absolved from all semblance of subordination one to another, yet they remain firmly cemented into one mighty sisterhood of seven members, the British Commonwealth of Nations, within the British Empire.

Each dominion now is sole judge of the nature and extent of its coöperation in enterprises which affect the other members. In recognition of the new status, the title of His Majesty, King George V, was changed to read as follows:

George the Fifth, by the Grace of God, of Great Britain, Ireland, and the British Dominions beyond the seas, King, Defender of the Faith, Emperor of India.

The status of the Governor-General of each dominion was also newly defined. It was ordained that—

The Governor-General of a dominion is a representative of the Crown, holding in all essential respects the same position in relation to the administration of public affairs in the dominion as is held by His Majesty the King in Great Britain, and that he is not a representative or agent of his Majesty's government

Self-Governing Colonies. There are at present but two of these—Malta, in the Mediterranean Sea, and Rhodesia, in South Africa. Their self-rule is somewhat restricted; in all relations other than local, their acts must be approved

by the home government. The inhabitants are British subjects.

Crown Colonies. In these, the local authority is subordinate to the British government, through the Secretary of State for the Colonies. In certain local matters, their legislatures may act independently. The inhabitants are British subjects. The chief crown colonies are the Bahama Islands, the Bermuda Islands, and Barbados.

Protectorates. These are governed on colonial lines, but they differ from colonies in that they are not parts of the empire, and their inhabitants are not British subjects. The latter are uncivilized, or only partially civilized peoples; the governor, usually styled High Commissioner, leaves all proper power in the hands of local chiefs.

India and Indian States. India is under the immediate control of a Viceroy (vice-king), with no superior in authority except in the London India Office. This official is the highest in rank in the British diplomatic service. The powerful and immensely wealthy chiefs of the Indian native states, who are known as maharajahs, are permitted all possible latitude consistent with the public good in the administration of local affairs; nearly every local governmental function is therefore in the hands of the natives. The maharajahs proved their loyalty to the British in a striking manner during the World War.

[The government of India is further explained in these volumes in the article on that country.]

Extent of the British Empire

	Area, Square Miles	Population, Latest Census.		Area, Square Miles.	Population, Latest Census
UNITED KINGDOM...	94,284	44,173,000	NORTH AMERICA...	3,847,457	9,266,000
England	50,874	35,078,000	Canada	3,684,723	8,999,000
Wales	7,466	2,206,000	Alberta	255,285	(c) 607,000
Scotland	30,405	4,882,000	British Columbia	355,855	560,500
Northern Ireland	5,237	(c) 1,256,000	Manitoba	251,832	(c) 630,000
Isle of Man	227	60,000	New Brunswick	27,085	387,000
Channel Islands	75	80,000	Nova Scotia	21,428	523,000
Europe	30,300	3,540,000	Ontario	407,262	2,933,000
Irish Free State	26,592	(c) 2,972,000	Prince Edward Island	2,184	88,000
Gibraltar	2	(c) 17,000	Quebec	594,434	2,361,000
Malta	122	(c) 225,000	Saskatchewan	251,700	(c) 820,000
Cyprus	3,584	(c) 324,000	Yukon	207,076	4,000
ASIA	1,061,376	329,320,000	Northwest Territory	1,309,682	7,000
India	1,805,432	318,885,000	Newfoundland	42,734	263,000
British Provinces	1,094,300	246,946,000	Labrador	400,000	4,000
Native States, etc	711,032	71,930,000	CENTRAL AMERICA		
Ceylon	25,332	(c) 5,000,000	British Honduras	8,598	46,000
Maldiv Islands	115	70,000	WEST INDIES	12,423	1,773,000
Aden (inc Perim)	80	56,000	Bermudas	10	20,000
Socotra	1,382	(c) 12,000	The Bahamas	4,404	(c) 54,000
Bahrein Islands	250	(c) 120,000	Barbados	166	156,000
Straits Settlements	1,600	(c) 937,000	Jamaica	4,450	858,000
Federated Malay States	27,648	(c) 1,404,000	Turks and Caicos Isl'ds	165	5,000
Other Malay States	23,355	1,123,000	Cayman Islands	80	5,000
British North Borneo	31,166	257,000	Leeward Islands	648	122,000
Brunei	2,500	(c) 26,000	Windward Islands	516	(c) 168,000
Sarawak	42,000	(c) 600,000	Trinidad and Tobago	1,976	(c) 381,000
Hong Kong and Ter.	301	662,000	SOUTH AMERICA		
Wei-haiwei (until 1930)	285	154,000	British Guiana	94,008	301,000
AFRICA	3,871,357	50,008,000	Falkland Islands and	80,480	207,000
Union of South Africa	794,347	6,033,000	Georgia	4,618	(c) 3,000
Cape of Good Hope	276,066	2,782,000	AUSTRALASIA	3,278,591	7,777,000
Natal	35,284	1,420,000	Australia	2,074,581	(a) 5,495,000
Orange Free State	49,647	628,000	New South Wales	300,442	2,100,000
The Transvaal	110,450	2,087,000	Victoria	87,884	1,531,000
S W Africa (M)	322,000	232,000	Queensland	670,500	755,000
South Africa	732,909	2,814,000	South Australia	380,070	405,000
Basutoland	11,716	(c) 515,000	Western Australia	975,920	332,000
Bechuanaland Prot	275,000	152,000	Tasmania	26,215	213,000
Northern Rhodesia	201,000	(c) 1,154,000	Northern Territory	523,620	3,000
Southern Rhodesia	148,575	(c) 873,000	Federal Territory	940	2,000
Swaziland	6,678	(c) 117,000	Papua, Territory of	90,540	(c) 275,000
West Africa	493,628	22,681,000	New Guinea (M)	91,000	(c) 338,000
Nigeria, Northern	276,034	10,250,000	Bismarck Islands	14,000	(c) 188,000
Nigeria, Southern	91,894	8,371,000	Solomon Islands	5,100	(c) 17,000
Gold Coast, Ashanti	91,690	2,298,000	New Zealand	103,862	(c) 1,407,000
Sierra Leone Colony			Western Samoa (M)	1,260	(c) 40,000
and Protectorate	30,000	1,541,000	Nauru (M)	8	(c) 2,000
Gambia Colony			Cook Island	990	(c) 13,000
and Protectorate	4,010	210,000	OCEANIA	28,365	430,000
British East Africa	835,764	11,395,000	Fiji Colony	7,435	(c) 163,000
Kenya Colony			Tonga Islands Prot	390	(c) 25,000
and Protectorate	245,060	(c) 2,575,000	Gilbert and Ellice		
Tanganyika (M)	373,494	4,123,000	Islands Colony	180	29,000
Uganda Protectorate	94,204	(c) 2,977,000	British Solomon Islands		
Zanzibar Protectorate	1,020	(c) 215,000	Protectorate	14,600	(c) 150,000
Nyassaland	37,890	(c) 1,175,000	New Hebrides (with		
Somaliland			France)	5,700	(c) 60,000
Protectorate	68,000	(c) 347,000	Other Pacific islands	60	(c) 1,000
Anglo-Egyptian Sudan	1,014,600	(c) 5,852,000	(M)—British mandate		
Ascension Island	34	250	The mandates for Iraq		
St Helena Island	47	3,000	(are, 143,240 square miles, population, estimated,		
Tristan de Cunha	3	105	3,000,000) and Palestine (area, estimated, 9,000		
Seychelles Island	156	(c) 25,000	square miles, population, estimated, 852,268) are		
Mauritius Island	720	(c) 381,000	not included in any table above. (a)—Exclusive of		
Dependencies	89	(c) 8,000	aborigines, estimated at 60,000; (c)—Census of		
			April, 1926, (e)—Official estimates.		

Mandated Territories. Foreign possessions lost to Germany and territory wrested from Turkey, resulting from the World War, were placed under the care of the League of Nations, and by that body parceled out to the great

powers. These mandates were not intended to run in perpetuity; the powers accepting mandates were charged with control of a nature which should teach the subject peoples the arts of government, to the end that some day they

might achieve independent status. Britain's most valuable mandates are Palestine and Iraq, both of which will in time acquire the ability to rule themselves. In Tanganyika Territory (formerly German East Africa), where there are millions of native Africans, the mandate bids fair to be practically permanent. Southwest Africa (the former German Southwest Africa) was mandated to the Union of South Africa. Australia and New Zealand received mandate powers over various Pacific islands. About a dozen mandates were assigned to Great Britain or to other members of the Commonwealth; a High Commissioner is the directing head in each.

Area and Population. The Empire covers an area of 13,370,825 square miles, and the population is approximately 450,000,000. It is the proud boast of every son of Britain that "the sun never sets on the British flag." In the accompanying table, the areas as printed are in some instances careful estimates; population figures are those of the latest census reports or are official estimates.

E.D.F.

Related Subjects. The reader is referred in these volumes to scores of articles which will enlarge one's knowledge of the British Empire. Not all of them are listed below; many are given under headings relating to important political divisions, such as England, Scotland, etc. In connection with the above description of the empire, reference is suggested to the following

Australia, Commonwealth of	Man, Isle of
Canada, Dominion of	Mandated Territories
Channel Islands	Newfoundland, Dominion of
Colonies and Colonization	New Zealand, Dominion of
England	Palestine
Governor-General	Revolutionary War in
Great Britain	America
India	Scotland
Iraq	Union of South Africa
Ireland	Viceroy
League of Nations	Wales
	World War

BRITISH GUIANA, *ge ah' nah*, a colony on the northeastern coast of South America, facing the Atlantic Ocean, 4,000 miles from the British Isles. It has an area of 89,480 square miles. The population is about 308,000, exclusive of the uncivilized natives, who inhabit the unexplored interior of the country. The numbered population lives mostly along the coast and the banks of the rivers, where plantations have been developed. The majority of the people are negroes and East Indians; there are many Portuguese, a few Chinese, and a small number of white people from the British Isles.

The Land. British Guiana is divided into three principal settlements, Essequibo, Demerara, and Berbice, named from the three principal rivers, which flow parallel across the country to the sea; they are navigable for some distance inland, but falls and rapids interrupt their courses in the mountains. The Guiana highlands form the interior and greater part of the area; they are covered with well-timbered grasslands, dense forests, largely unexplored,

and some high mountains. They descend gradually toward the coast, which is very low and subject to the intense heat and heavy rainfall typical of countries in the tropics.

Resources. The chief wealth of the country lies in its agricultural possibilities. The soil in the coast region is very rich, and sugar, rice, sea-island cotton, and coffee are grown in considerable quantities. There are also extensive plantations of coconuts, cacao (cocoa), rubber, and limes. Much of the work is done by East Indian and Chinese laborers, called *coolies*. The highlands form an ideal grazing country, and some cattle and sheep are raised. In the heavy forest growth, scarcely explored as yet, valuable woods abound. Gold and diamonds are mined in the mountainous regions, and other ores exist untouched.

The country possesses vast possibilities, but lacks laborers and means of transportation; there are only a hundred miles of railway, and river transportation is limited.

Government and History. A governor, appointed by the British Crown, a council, and a court of policy constitute the executive department, and the legislature consists of seven appointed and eight elected members.

The Dutch made the first settlements in Guiana in 1613, and not until 1815 did the British make good their claim to the territory, though they had previously attempted its conquest. The latter part of the nineteenth century saw the country much disturbed by boundary disputes with Venezuela and Dutch Guiana, but these were settled in 1899 by an international commission.

The Cities. These are located largely on the coast. They are small, and not numerous; only the capital is of any importance:

Georgetown, originally STABROEK, as a Dutch village, is the capital and chief seaport. So low is the coast that many of the streets flow with water from the tide, and the houses are built on piles. Though the climate is hot, this curious city is clean and healthful. It has many modern conveniences, both Anglican and Roman Catholic cathedrals, a large hospital, a fine museum rich in native fauna, and a botanical garden. The city is prosperous and well governed.



LOCATION MAP

The small black area compares the size of British Guiana with the entire continent

Georgetown has various factories for making cigars, rice products, chocolate, and articles for local domestic use. Its chief connections are by water, along the coast and up the rivers, and as the commercial center,



COMPARATIVE AREAS

British Guiana is nearly 7,000 square miles larger than the North American state of Idaho.

it exports sugar, rum, rice, gold, diamonds, and rubber. The population of about 55,000 includes many Portuguese

BRITISH HONDURAS, called **BELIZE** until 1930, is a dependency of Great Britain, in the northeastern part of Central America. From the year 1636, it was frequently visited by log-cutters, but the first permanent settlement was made early in the eighteenth century by a Scotchman. The Spaniards, holders of the adjacent territory, frequently tried to drive out the settlers, but in 1783 a treaty formally recognized the right of Great Britain to develop the section, provided all British subjects in the Spanish parts of Central America removed at once to Belize, as it was then called. It was not until 1836 that the colony was recognized as a permanent possession of Great Britain. Since that time the country has progressed steadily, and is in many ways more advanced than the independent Latin countries of Central America.

This small colony is sparsely settled, having a population of about 46,000 in an area of 8,598 square miles. Scarcely a thousand of the inhabitants are whites, the great majority being negroes, Indians, and half-breeds.

The coast, which faces the Caribbean Sea, is low and swampy, and is covered with dense forests. The climate is subtropical, and in

spite of dampness and occasional epidemics of yellow fever and cholera, the colony is not as unhealthful as are most of the Central American states. Toward the western boundary, the elevation increases to about 3,000 feet.

It was the timber, especially mahogany and logwood, which led Great Britain to acquire the colony, and timber has remained the chief product. Numerous palms, some of them valuable, grow wild. Bananas, sugarcane, coconuts, and coffee are cultivated, but in all the colony there are fewer than 400 square miles of land under tillage. The trade, consisting chiefly of timber and chicle (the base of chewing gum), is largely with the United States, Great Britain ranking second.

The government of the colony is in the hands of a governor, assisted by an executive and a legislative council, all appointed by the government of Great Britain.

In the neighborhood of the cities, there are fairly good roads, but elsewhere they are very poor, and there are only twenty-five miles of railway. See **CENTRAL AMERICA**; **NORTH AMERICA** (colored maps).

The cities are small and unimportant, with the exception of the capital:

Belize, *be lee'z*, the chief seaport and the capital, is a thriving town, situated at the mouth of the southern arm of the Belize River. It has a harbor available for small vessels, but ocean-going steamers have to anchor a mile or more from the river mouth and land their cargoes by lighters. The city has been noted for more than three hundred years as the center of the mahogany and logwood trade of the world. It also exports rosewood, cedar, coconuts, and sugar. Nearly one-fourth of the entire population of the country live in Belize, its inhabitants numbering about 13,000.

BRITISH ISLES, the most important archipelago in the world, bounded by the English Channel, Strait of Dover, North Sea, and the Atlantic. The parts include Great Britain, consisting of England, Scotland, and Wales; the Irish Free State and Northern Ireland, comprising the island of Ireland; Isle of Man; the Hebrides; the Orkneys and Shetland Islands, and numerous small and unimportant islands and islets. For full description and history, see **BRITISH EMPIRE**; **GREAT BRITAIN**; **ENGLAND**; **SCOTLAND**, etc.

BRITISH MUSEUM. In 1753, Sir Hans Sloane, a British physician and naturalist, be-

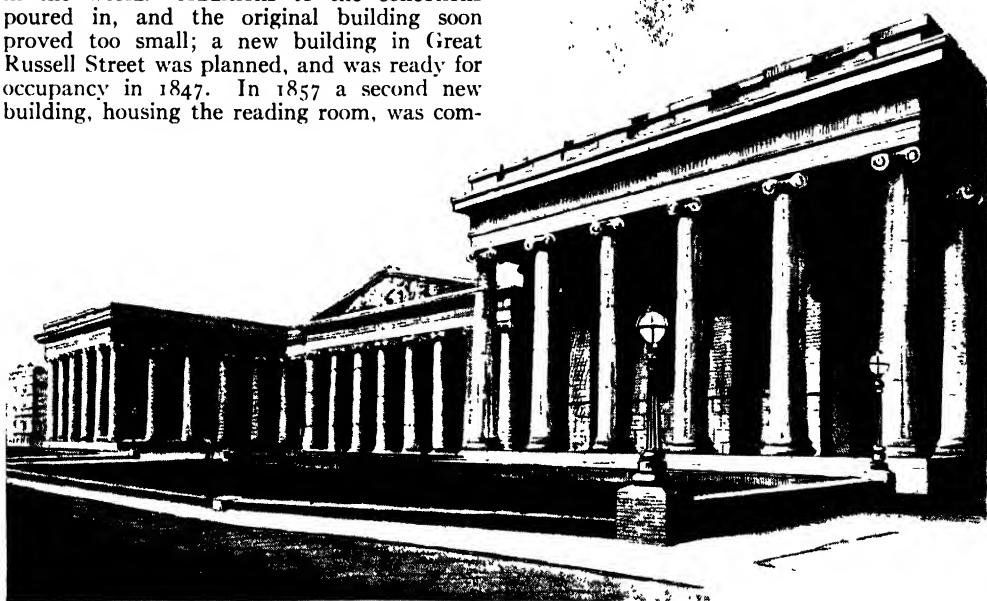


LOCATION MAP

queathed to the nation his various collections, including 50,000 books and manuscripts, on the condition that \$100,000 be paid to his heirs. The offer was accepted, and the collections were arranged in Montague House, in London, and were first opened to the public on January 15, 1759.

In such manner originated the British Museum, now the foremost institution of its kind in the world. Additions to the collections poured in, and the original building soon proved too small; a new building in Great Russell Street was planned, and was ready for occupancy in 1847. In 1857 a second new building, housing the reading room, was com-

pleted at a cost of \$750,000. The vast library, which has almost 4,000,000 volumes and is gaining new ones at the rate of many thousands a year, occupies fifty-five miles of shelves, and requires hundreds of volumes for its catalog. The circular reading room is 140 feet in diameter, and accommodates 300 readers. Admission is by ticket, but anybody may obtain one by complying with a few



THE BRITISH MUSEUM

pleted at a cost of \$750,000. In 1879 the White Wing was added. The accommodations were still inadequate, however, and it was resolved to separate the objects belonging to the natural history department from the rest, and to lodge them in a building by themselves. Accordingly, a large natural history museum was built at South Kensington, and the specimens pertaining to natural history, including geology and mineralogy, were transferred to it in 1881. In 1911 an annex to the museum proper was opened.

General Features. The museum is under the management of forty-eight trustees. It is open daily, free of charge, and there are official guides whose duty it is to point out to visitors the most interesting points. Stupendous as are the collections, they are so arranged and cataloged that they are easy of access. That people avail themselves of the advantages of this great institution may be seen from the fact that the reading rooms are used each year by about 200,000 persons, while several times that number visit the various departments.

Divisions. Of the eight departments into which the museum is divided, that most used

simple conditions. Under the copyright act now in force, the museum is entitled to a copy of every book published in the United Kingdom and the Irish Free State.

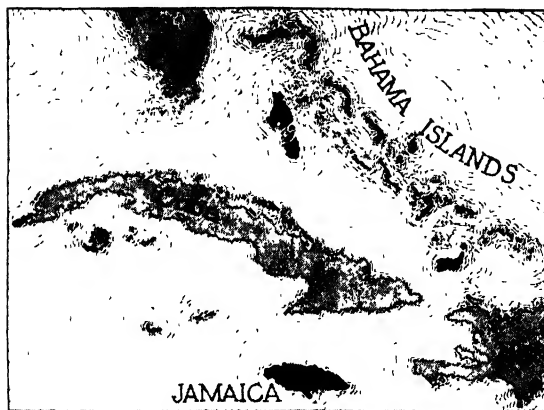
The manuscript collection consists of almost 55,000 volumes, in addition to 85,000 charters and 2,400 papyri. Many documents important in state history are to be found there, as well as unpublished memoirs which throw much light on the history of the times in which they were written. The department of Greek and Roman antiquities attracts many visitors, for it contains the famous Elgin Marbles (which see), representing the very highest period of Greek art.

Then, too, there are coins and medals, ancient and modern; British antiquities, which include memorials of the time when Roman civilization was carried to Britain; prints and drawings; and a remarkably complete collection of the remains of Egyptian and Assyrian civilization. Sculptures, scarabs, mummies, the famous Rosetta Stone (which see), carved inscriptions from thousands of years before the Christian Era—all these are to be found in orderly array in the Egyptian and Assyrian rooms.

The South Kensington natural history collections are as rich as are those in the main museum, and school children by thousands flock there to see the stuffed animals from all over the world, the collections of nests and eggs,

of Canada but is not included in any province." G.H.L.

[For details of the governmental organization established by the British North America Act, see CANADA (Government)]



BRITISH WEST INDIES (In Black)

the plants, the gorgeous butterflies, and the birds, placed in such natural attitudes and surroundings that they seem to be alive.

[For a description of the largest library on the Continent, the national library of France, see BIBLIOTHEQUE NATIONALE.]

BRITISH NORTH AMERICA ACT, the official title of an act passed by the British Parliament in March, 1867, providing for the formation of the Dominion of Canada. On May 22 Queen Victoria issued a proclamation "for uniting the provinces of Canada, Nova Scotia, and New Brunswick, into one Dominion, under the name of Canada," and on July 1, 1867, the act went into effect. This day is now celebrated each year as Dominion Day, the birthday of the Dominion of Canada. See DOMINION DAY.

By the terms of the act, the province of Canada, which had been formed in 1841 by the union of Upper and Lower Canada, was again divided, and the provinces were given the names of Ontario and Quebec. New Brunswick and Nova Scotia retained their names, and provision was also made for the future admission of other provinces.

The British North America Act has been several times amended. The first time was in 1871, when the British Parliament removed doubt as to the power of the Canadian Parliament to establish provinces in the territories acquired after the passage of the original act. Again, in 1875, it was found necessary to define more clearly one of the sections regarding the powers of Parliament, and in 1886 the Dominion Parliament was given authority to admit representatives from "any territory which for the time being forms part of the Dominion

smaller islands and islets.

For purposes of administration, they are divided into Crown colonies, governed by the Crown of Great Britain through governors appointed in London, and colonies with a limited amount of self-government. The federation of all of these British islands into one self-governing colony has been several times considered, but has not been found practicable.

The climate is healthful, and, although at times the heat is excessive, refreshingly cool breezes blow from the sea. Agriculture is the principal occupation of the inhabitants, most of whom are of mixed races. Sugar, fruit, vegetables, and cereals are grown. Locust trees grow to enormous size, and there are many specimens said to be 4,000 years old. A kind of rice which, unlike the usual species, requires little irrigation, is extensively cultivated.

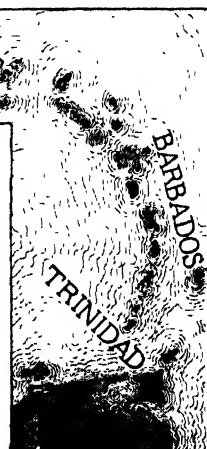
Related Subjects. Each group of islands named above is described elsewhere in these volumes. For a list of all parts of the British Empire, see BRITISH EMPIRE, AND BRITISH COMMONWEALTH OF NATIONS.

BRITTANY, *brit' a nie*, OR **BRETAGNE**, *bre-tahn' y'*. On the northwestern coast of France, between the English Channel and the Bay of Biscay, is the peninsula of Brittany, a region of absorbing interest to the archaeologist, the student of folklore, and the tourist. In very early times, this region was peopled by tribes who held to a crude form of worship similar to

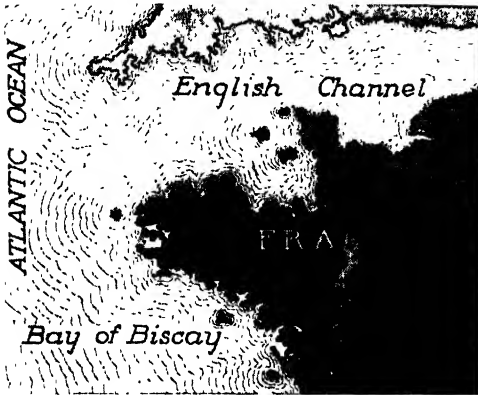
BRITISH SOMALILAND, *so mah' le land*. See SOMALILAND.

BRITISH STANDARD CANDLE. See CANDLE AND CANDLE POWER.

BRITISH WEST INDIES, *in' diz*, a term embracing those islands in the West Indies, sometimes called THE ANTILLES, which are possessed by Great Britain. They include the Bahamas, Barbados, Jamaica, Leeward Islands, Windward Islands, Trinidad, Tobago, and numerous



that of the Druids, as numerous stone monuments bear witness. Known anciently as *Armorica*, a name meaning *near the sea*, the land came under the control of the Romans in 51 B.C., and enjoyed with the rest of the empire two centuries of peace and prosperity. As the empire declined, Armorica lapsed into barba-



LOCATION OF BRITTANY

ism. Later, in the fifth century, this westward-pointing peninsula, so near to British shores, became a place of refuge for the Celtic tribes who were driven out of Britain by the Angles and the Saxons. Once more a civilization developed in the land, which the new inhabitants named "Little Britain." See CELTS; ANGLES; SAXONS.

The descendants of these early Bretons have an individuality that sets them apart from other Frenchmen. They are extremely conservative, especially in matters of religion, and their devout Catholicism is colored by many a pagan superstition. The wayside crucifixes and shrines, the village churches, the religious festivals, and the common belief of the people that a higher Power orders every incident in their lives, all testify to a faith that has never changed. Dear to the Breton, too, are the accumulations of legend and folklore which have been cherished for centuries; and he venerates the customs and language of his forefathers even when he must yield to new ideas.

In disposition, the Breton inclines to be melancholy, for the peasant character has reacted to the gloomy effect of the bold and rocky coast; to the stern aspect of the low granite mountains; to the dreariness of the winter season, with its wild gales and heavy fogs. Yet the quiet mien of the Breton does not reveal his full character. He can enter joyfully into the village revels and festivities, and he can fight vigorously, both for his personal rights and to avenge his country.

Fearless sailors have been born and bred in the coast region, and their exploits give color and distinction to the sea annals of the French.

The statement is no longer true, however, that Brittany is unaffected by modern progress. Its port towns of Brest, Saint Nazaire, and Nantes are busy places, and its many railway lines and motor highways keep the people constantly in touch with the outside world. Though there is much uncultivated ground, agriculture is carried on in the northern river valleys according to the newer methods. The tourist of to-day who journeys to Brittany for local color may look in vain for the quaint peasant costumes he has read about. Except in the remote country places, those picturesque garments have been replaced by modern garb.

Brittany is the traditional birthplace of King Arthur and many of his Knights of the Round Table, and is the historical home of Abelard, the great philosopher and theologian; Jacques Cartier, the discoverer of the Saint Lawrence River; and Ernest Renan, French philologist and historian.

This region was incorporated with France in 1532. It is not a definite political division, but corresponds very nearly to five departments, having an area of 13,640 square miles. See FRANCE, and biographies of the persons mentioned above. B.M.W.

BROADCLOTH, a soft, woolen fabric of superior quality, plain or twilled, recognized by its smooth, lustrous surface. Its Anglo-Saxon name is traceable to the fifteenth century, when a distinction arose between *broad cloth* (cloth two yards wide) and *strait* (cloth of one yard or narrower). The designation broadcloth has been retained, although this material to-day has been narrowed to only sixty inches in width.

From the sheep to garments of broadcloth is a story of many careful processes—shearing of the sheep; selection of best parts; perhaps dyeing; oiling, carding, spinning into yarn; then weaving, shrinking, felting, stretching, napping, and shearing; and finally hot pressing, to give it an attractive polish.

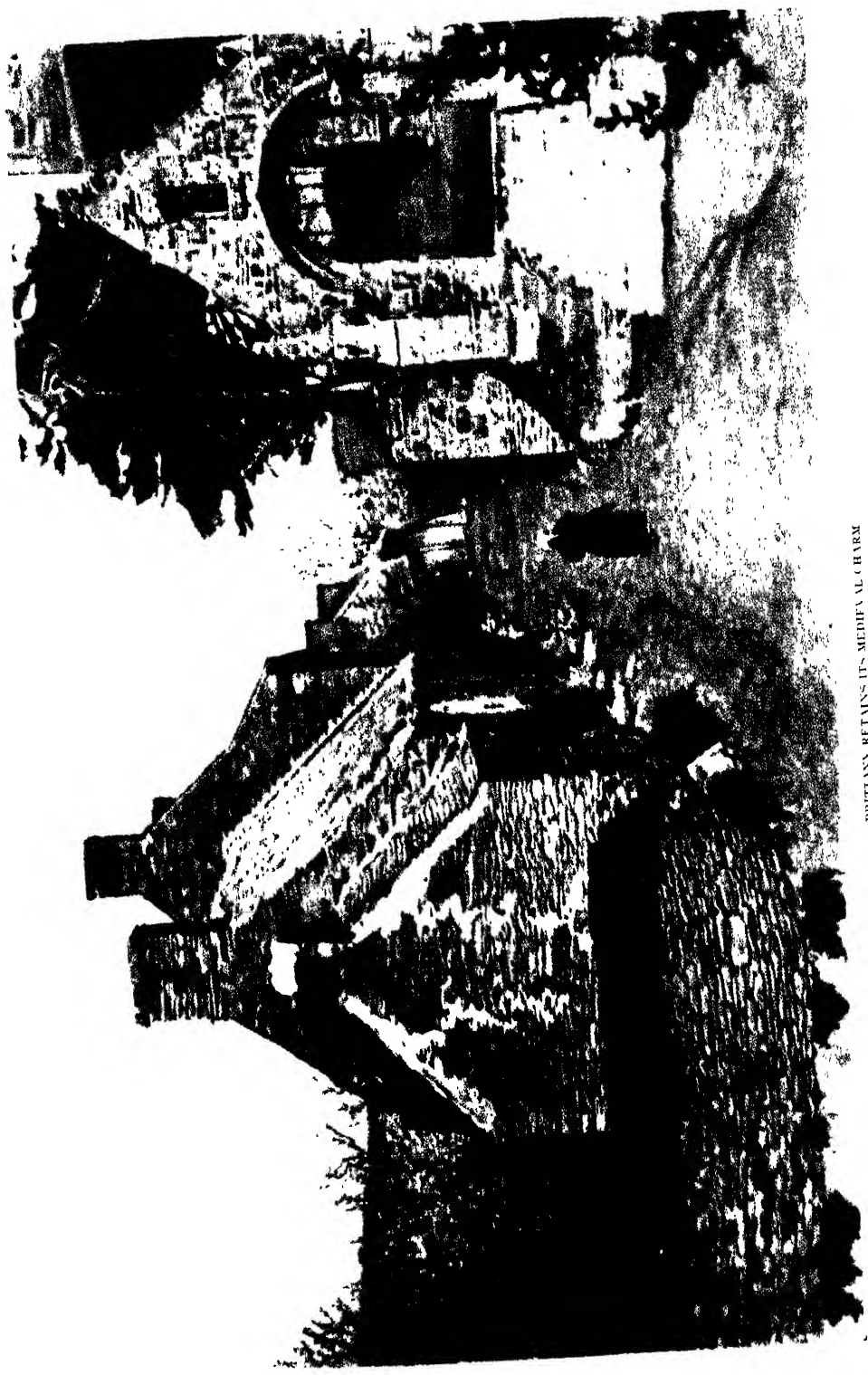
[For list of cloths of all kinds see Related Subjects list, in the article TEXTILE.]

BROAD RIVER. See SOUTH CAROLINA (Rivers).

BROADSWORD, *brawd' sohrd*, a broad-bladed, single-edged short sword, designed for cutting but not for stabbing. Swords used in warfare now are more flexible than broadswords, and are intended for both cutting and stabbing.

The broadsword was formerly used by regiments of cavalry and Highland infantry in the British service, but was not the best weapon for defense. The *claymore*, a type of broadsword, but double-edged and longer, was the national weapon of the Highlanders.

Literary Reference. This weapon is mentioned in Scott's *Marmion*:



BRITTANY RETAINS ITS MEDIEVAL CHARM

O young Lochinvar is come out of the west.
Through all the wide Border his steed was the best;
And, save his good broadsword, his weapon had none,
He rode all unarmed, and he rode all alone.

BROBDINGNAG, *brob' ding nag*. See GULLIVER'S TRAVELS.

BROCADE, *bro kade'*, a cloth enriched with raised flowers, foliage, or other ornaments, this pattern often being in gold and silver threads. The term is restricted to materials which are figured in the loom, as distinguished from those which are embroidered after being woven, though the word *brocade* is derived from the French verb meaning *to work with the needle*. Brocade may be made of cotton, linen, silk, or wool, but the name is generally applied to silk or to silk and cotton. Brocade was manufactured in Oriental countries at an early date, and in Europe as early as the thirteenth century. It is used on furniture, in hangings, and in gowns, and for centuries has been a favored fabric for royal garments. The invention of the Jacquard loom attachment by the French weaver, Jacquard, has made possible many beautiful effects in the weaving of brocade and other cloths.

Related Subjects. For list of cloths of all kinds, see Related Subjects, in the article TEXTILE, see also, JACQUARD, JOSEPH MARIE

BROCK, SIR ISAAC (1760-1812), a British soldier whose distinguished service in America won for him the title "Hero of Upper Canada." Early in his career, he served in the West Indies, in Holland, and with Lord Nelson, and in 1802 was sent to Canada to suppress a rebellion of the troops. In 1806, when war between England and the United States was threatening, he was placed in command of the garrison at Quebec, and was given the rank of major general. On the outbreak of the War of 1812, Brock made active preparations for the defense of the Canadian frontier; on August 16, 1812, he captured Detroit, where General William Hull was in command (see HULL, WILLIAM), receiving the ignominious surrender of the entire American force. Brock was mortally wounded on October 13, while leading his men against an American attack on Queenstown (now Queenston), near Niagara Falls. On Queenston Heights, the site of the battle, a monument has been erected to his memory. See WAR OF 1812.

BROCKEN. See HARZ MOUNTAINS; GERMAN (Physical Features).

BROCKTON, MASS., a shoe-manufacturing center and the county seat of Plymouth County, is located in the southeastern part of

the state, twenty miles south of Boston, and twenty-nine miles north of Fall River. The city was settled in 1700, and was incorporated as the town of North Bridgewater in 1821. Its present name was adopted in 1874, and the charter was granted in 1881. The area exceeds twenty-one square miles. Population, 1930, 63,695.

Railroads. The New York, New Haven & Hartford Railroad serves the city, and there is electric and motorbus connection with surrounding towns.

Industry. The city is the industrial center for all the people living in the surrounding towns of East and West Bridgewater, Avon, North Easton, Randolph, Whitman, and Holbrook. Over fifty shoe factories have an annual output of \$100,000,000, and four last factories make over 1,000,000 pairs of lasts every year. The manufacture of shoe accessories, and of rubber goods, wooden and paper boxes, sewing machines, pianos, automobiles, gloves, razors, and sporting goods is also extensive.

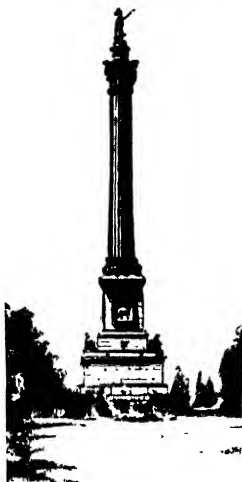
BROKEN WIND, a disease of horses commonly called heaves (which see).

BROKER, one who acts as an agent for another in a business transaction, and charges a certain sum for his services. Such charge is called *commission*, or *brokerage*, and is always based on a definitely arranged percentage of the sum involved in the transaction. Brokers usually confine themselves to one line of business, being called, accordingly, *stock brokers*, those who deal in stocks and bonds, *note brokers*, *insurance brokers*, *ship brokers*, etc.

Although both conduct business in practically the same manner, there is a difference between a commission merchant and a broker. Both are paid by commission, but while the commission merchant receives on consignment, sells, and makes delivery of certain goods, while acting as an agent, the broker does not necessarily have possession of the goods or stock bought and sold. The broker forms the connection between two principals and hands to each a written statement of the bargain. F.I.E.

BROMIDES, *bro' mydz*, the name given to compounds of bromine with potassium, silver, and other metals (see BROMINE). Bromide of potassium is extensively used in medicine and in photography. It is found in the form of white crystals, shaped like those of common salt. As a medicine, it produces a soothing effect on the nerves, but it is dangerous to use except on a physician's prescription. It is used in photography in making silver bromide, which is very sensitive to the light, and in preparing sensitized plates and films (see PHOTOGRAPHY).

T.B.J.



TOWERING ABOVE
QUEENSTON HEIGHTS

BROMINE, *bro' min*, a chemical element which at ordinary room temperature has the form of a dark-brown liquid. Bromine is very active, it vaporizes readily, and is moderately soluble in water. Its vapor is extremely disagreeable (the name is from the Greek *bromos*, meaning a *stench*), and the liquid produces severe burns when spilled upon the skin.

Bromine is obtained as a by-product in the salt industry. It has long been made from the brines of the salt wells of Michigan and Ohio, and from solutions of the salts found at Stassfurt, Germany, but the demands of American industry have led to the possible development of a method of extracting the element from sea water. This method has not, thus far, found very wide application. Bromine is used in medicine, photography, the moving-picture industry, in the manufacture of dyestuffs, in metallurgy, and in the production of the ethyl fluid of motor fuel. It was one of the tear gases used in the World War. Its chemical symbol (see CHEMISTRY) is *Br*. See BROMIDES; HALOGENS. T.B.J.

BRONCHITIS, *bron ki' tis*, inflammation of the bronchial tubes. *Acute bronchitis* results from an infection. The patient has a cough with expectoration, fever, and more or less pain and soreness of the chest. A common cold may extend from the nose to the bronchi, causing bronchitis, or a bronchitis may extend to the lung substance, causing some form of pneumonia. A patient with acute bronchitis with fever should remain in bed in a well ventilated room. In this way, pneumonia is sometimes avoided. When the fever subsides, it is safe to leave the bed and cautiously to resume work.

Chronic bronchitis is a chronic inflammation of the bronchial tubes. It is due to infection. Among the contributing causes are heart disease, hay fever, and asthma. On the other hand, old cases of chronic bronchitis may develop asthma. Chronic bronchitis is characterized by chronic cough, much expectoration, and some shortness of breath. Care should be taken to avoid the error of mistaking consumption for chronic bronchitis. See LUNGS; ASTHMA. W.A.E.

BRONCHO, *brong' ko*, **BEAN**. See JUMPING BEAN.

BRONCHUS, *brong' kus*. See LUNGS.

BRONSON, BETTY. See MOVING PICTURES (list of players).

BRONTE, *bron' te*, CHARLOTTE (1816-1855). The writings of this English novelist possess no more fascination and no greater appeal than does her life, though the latter was gloomy and almost eventless. Her clergyman father removed in 1820 from Thornton, where Charlotte was born, to Haworth, and there in the dreary parsonage, with the stern Yorkshire moors on every side, the remarkable Bronte children grew up. Charlotte was the eldest of

four who survived childhood. Mrs. Gaskell, in her *Life of Charlotte Bronte*, shows to the reader very clearly the dreariness of the "home among the graves," and the unquelled spirit of the Bronte sisters.

For a time in their childhood, Charlotte and her sister Emily attended a school to which the former brought later an unenviable fame by her descriptions in *Jane Eyre*, but their education was continued elsewhere. After teaching and serving as governess, Charlotte went with Emily in 1842 to Brussels, with a view to learning French and German.

She taught for a year in the school she had attended there, but returned to Haworth in 1844, convinced that whatever happened, she must remain home with her family. Her father was rapidly becoming blind, her brother was drinking himself to death, and her two sisters were feeling the first touches of a disease which was shortly to cause their death. To support themselves, the three sisters turned to writing, and in 1846 published a volume of poems under the names of Currer, Ellis, and Acton Bell. It was issued at their own risk, and attracted little attention, so the sisters turned to fiction, and each produced a novel. Charlotte wrote *The Professor*, but it was refused by publishers everywhere, and did not appear until after her death. *Jane Eyre*, her next novel, had a different fate, for on its appearance in 1847, it took the world by storm. It had faults of style, but its realism, and above all, its passion, sounded a new note in literature. A second novel, *Shirley*, appeared in 1849, and *Villette*, based on her experiences in Brussels, in 1853.

Meanwhile, her sisters and brother had died, and an unbroken gloom settled over her life. In 1854 she married her father's curate, the Rev. Arthur Nicholls, and she had a few happy months. Worn out, however, by the tenseness of her nature and the violence of her inner protests against her lot, no less than by the cold, cheerless home and bleak climate, she died in 1855.

BRONZE, *bronz*, a hard, durable, sounding metal made by melting copper and tin in varying proportions, with occasionally the addition of small quantities of lead, zinc, or other metal. Such metallic mixtures are called *alloys*. That a mixture of tin and copper is harder than either metal used by itself had been known for many centuries and in many different countries



Photo Brown Bros

CHARLOTTE BRONTE

(see BRONZE AGE). Bronze melts readily, is easily worked, molded, and tooled; it does not rust when exposed to moisture, and takes a fine, smooth finish. These properties, combined with its possibilities in the way of artistic and beautiful coloring, make it a valuable material for statuary, lighting fixtures, and ornamental work in great variety.

The mechanical uses of the metal also are numerous. Bronze bells give a wonderfully rich tone, and they withstand the weather indefinitely. Besides *bell metal* (three to five parts of copper to one of tin), there are several other varieties of bronze, including *gun metal*, used for ordnance (ten per cent tin); *speculum metal*, suitable for mirrors and reflectors in telescopes (about thirty per cent tin); and *aluminum bronze*, used for the hulls of yachts and for utensils exposed to the corrosive action of chemicals. In the last mentioned, there is from five to ten per cent aluminum, and little or no tin. *Phosphor bronze*, which has a very small proportion of phosphorus, is exceedingly hard and strong, and is valued for machine bearings, valves, plungers for pumps, and similar devices. By reducing the amount of copper and adding antimony, anti-friction metals are made. The so-called *copper cent* is really made of bronze, since the metal used is an alloy of copper, tin, and zinc. See ALLOY. T.B.J.

BRONZE AGE, a term describing that period in the development of mankind when bronze, made from a mixture of copper and tin, as it is to-day, was used as the material for weapons, implements, and ornaments. It stood for a distinct advance in civilization, for before that time people had contented themselves with stone, a material which lay ready to their hand. Iron had not yet been discovered, or at least had not been reduced to useful form.

The Bronze Age is not an absolute division of time, but a relative condition of culture, which in some places may have been reached early, in others, late; in some, it may have been prolonged, and in others brief, or even non-existent, the people passing directly from the use of stone to that of iron. It is believed, however, that throughout much of Europe there was this stage for approximately eighteen centuries B.C., though it frequently overlapped the ages before and after it, bronze being used side by side with the earlier stone or the later iron. In North America, too, there was undoubtedly a Bronze Age, though the use of this alloy seems never to have been very extensive. C.W.

Related Subjects. The reader is referred in these volumes to the following articles

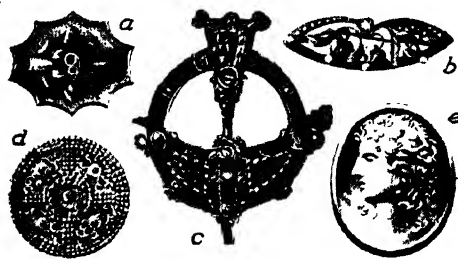
Age
Human Period

Iron Age
Stone Age

BRONZED GRACKLE. See CROW BLACK-BIRD.

BROOCH, brooch. The first brooches were thorns used to hold together the garments of

leaves worn in primitive times. Brooches of wood and bone next came into use, and subsequently, fastenings of metal. Metal brooches were worn by both men and women in Greece and Rome, and in other parts of Europe from



BROOCHES

(a, b) Modern brooches; (c) brooch of the sixteenth century; (d) Anglo-Saxon specimen; (e) modern cameo brooch

the time of Homer to the fall of the Western Empire. Typical of the times and the people, brooches often bore inscriptions, and it is an interesting fact that the oldest example of Latin now in existence is inscribed on a brooch. Brooches were often used, also, as a kind of amulet or talisman. They are now made chiefly of gold, silver, or platinum. Some are set with jewels or are decorated with enamel, while others are merely engraved.

BROOK FARM, an experiment in "brotherly coöperation" which owes much of its continued fame to Hawthorne's *Blithedale Romance*. In 1841, twenty New England Transcendentalists (see TRANSCENDENTALISM) attempted to prove that people could live happily and inexpensively on the product of their labor, and have time for intellectual pursuits. They accordingly bought at West Roxbury, Mass., 200 acres of land, where they organized the Brook Farm community, under the direction of George Ripley. Emerson, Margaret Fuller, Amos Bronson Alcott, Hawthorne, Charles A. Dana, and William Channing were connected with it. Each resident member did his allotted task, and all were paid equally for their labor. Oliver Wendell Holmes once said that "everything was common there but common sense."

At one time, there were as many as seventy members, and visitors from all parts of America came to view the experiment; but financial difficulties, together with the destruction of the chief building by fire, led to the association's discontinuance in 1847.

BROOKLINE, MASS. See MASSACHUSETTS (back of map).

BROOKLYN, N. Y., the largest city in America ever absorbed by another, was at the census years of 1860, 1870, and 1880 the third community in size on the continent. It lost this latter distinction to Chicago ten years

afterward, and in 1898 gave up its individual government and became a part of New York City. Were it still independent, it would again be the third city, for it now contains more people than Philadelphia. In 1920 the census reported 2,018,356 population; in 1930 the number of people had increased to 2,596,154 (census).

Though it is facetiously thought of as "The Sleeping-Room of New York," Brooklyn is a great manufacturing city, exceeding in the value of its products all other cities except New York (Manhattan), Chicago, and Philadelphia. Especially famous are its mammoth sugar refineries and the Brooklyn Navy Yard, where warships are built.

Brooklyn is connected with the island of Manhattan by four suspension bridges, by subway tubes, railway tunnels, and ferries. It is situated on Long

Island, and occupies the whole of King's County. Its name survives from the Dutch hamlet of Breuckelen, founded in 1636. Brooklyn is the greatest port in America, as a single unit, for over one-fourth of the foreign commerce of the United States is handled on its docks. Over 700 freight steamships reach "the seven seas" from here.

As one of the boroughs of New York City, Brooklyn has lost its political individuality. See NEW YORK (City).

BROOKLYN BRIDGE, the first bridge over the East River, connecting New York with Brooklyn, is famous because at the time of construction it was considered the greatest suspension bridge in the world, and it is still one of the most notable. It was fourteen years in building, having been begun in 1869 and finished in 1883, at a cost of \$15,000,000. The center span, between the towers, is 1,595½ feet; the side spans at either end are 930 feet; and as there is an approach of 1,562½ feet on the New York side and

of 971 feet on the Brooklyn side, the total length of the bridge is 5,989 feet, or somewhat more than a mile. Four great cables, each nearly sixteen inches in diameter, support the bridge; their resting places on the

towers are 329 feet above high water. With a total width of eighty-five feet the bridge carries a roadway, a double line of electric railway, and a broad promenade.

As the New York metropolitan district expanded, the one bridge was found inadequate, and three others of like proportions, the Manhattan, Williamsburg, and Queensboro, have been built farther up East River. The last named was opened for traffic during 1915. These also are suspension bridges, but of a somewhat improved type.

Related Subjects.

See **BRIDGE**, for another illustration of one of the New York-Brooklyn bridges, and for explanation of the suspension type



Photo. U. & U.

THE MAJESTY OF A GREAT BRIDGE

Looking toward Brooklyn along the promenade of the great Brooklyn Bridge, the first of the suspension bridges across East River, New York City.

BROOKS, PHILLIPS (1835-1893), one of the great pulpit orators of America, for twenty-two years the rector of Trinity Church, Boston, and for the last two years of his life bishop of the Protestant Episcopal Church in Massachusetts. Brooks was born in Boston; he traced his ancestry on his father's side to the Rev. John Cotton, of Puritan fame, and on his mother's side to the founder of the Phillips academies. He entered Harvard College when Lowell, Holmes, Agassiz, and Longfellow were teaching there, was graduated with high honors in 1855, and then studied for the ministry at the Alexandria (Va.) Protestant Episcopal seminary. Following his ordination in 1859, he became rector of the Church of the Advent in Philadelphia, and between 1862 and 1869 had charge of the Holy Trinity Church of that city.

During his long period of service later in Trinity Church, Boston, Brooks became one of the best-known men in America, distinguished alike for his broad, liberal views, intellectual gifts, eloquence, and winning personality.

Throughout an active life, by reason of dramatic oratory and literary power, Brooks was a leader of American thought.

His Literary Fame. Brooks wrote widely on religious subjects, important titles of his works including *Yale Lectures on Preaching*, *The Influence of Jesus*, and *The Light of the World*. Among his several Christmas and Easter carols the best-loved is *O Little Town of Bethlehem*, a stanza of which is here given:

O little town of
Bethlehem
How still we see
thee lie!
Above thy deep and
dreamless sleep
The silent stars go by;
Yet in thy dark
streets shineth
The everlasting
light;
The hopes and fears
of all the years
Are met in thee
to-night



Photo. Brown Bros.
PHILLIPS BROOKS

BROOKS, PRESTON S. See **PIERCE, FRANKLIN** (Administration: Assault on Sumner).

BROOM, the name of an ornamental shrub of the pea family. The common broom of Europe is bushy, with straight, angular, dark-green branches, and deep, golden-yellow, butterfly-shaped flowers. It is now well established in the United States, especially in New England. In Europe, the broom is used for tanning and dyeing, and the fibers are made into cloth. The tops and seeds have been used in medicine in cases of dropsy. This plant must not be confused with broom corn, which is described below. B.M.D.

In History. The name of the royal English family, *Plantagenet*, is derived from *planta*, meaning *sprig*, and *Gemista*, the generic name of this plant. One of the family used the broom for his crest. See **PLANTAGENET**.

BROOM CORN, OR BROOM GRASS, a member of the grass family, native of the East Indies, but extensively cultivated in the United States for the single purpose of furnishing material for making brooms. The plant is closely related to sorghum and kafir corn.

There are two kinds, *standard* and *dwarf*. The standard grows to a height of ten to fourteen feet; the dwarf, four to six feet. The stalk is pithy, with long, pointed leaves, which enclose it as in corn. The stem is jointed, and is topped by branched clusters of seed heads, which are used in making carpet brooms and clothes brushes. Before the plant is fully matured, the stem is broken over about eighteen inches from the top. This part is cut off, dried quickly in an airy, shady spot, and the seeds are removed. It is then ready for broom-making.

The stalks are used to some extent as forage. Oklahoma, Illinois, Kansas, and New Mexico are the leading states in broom-corn production. The surplus yield is exported. See **SORGHUM**; **KAFIR CORN**.

Brooms and Broom-Making. At one time (and in many places in Europe even now) brooms for rough sweeping were made of twigs; long-haired brushes were used in housework. In 1850, however, Americans discovered the value of broom corn for sweeping, and in 1850 Ebenezer Howard started a broom-making factory at Fort Hunter, N. Y.; this city is now the Eastern center of that industry. The corn is sorted as to size and quality; the green, tough, springy fibers, free from seed, are the most desirable. It is then sent to the factory in bales. The required number of the long fibers are bound by wire to a turned stick, or handle, about four feet long, enlarged at the end to which the brush is fastened. The broom is then flattened in a vise and sewed. The ends are trimmed evenly, and the broom is then ready for the market. Whisk brooms or small brooms for brushing clothing, are made in a similar manner, but are of the finer fibers, and often have ornamental handles. Most of the work of broom-making is by hand, and it is often done in penitentiaries and by the blind, for sightless people easily learn the comparatively simple operations. B.M.D.



BROOM CORN

Classification. Broom corn belongs to the family *Gramineae*. It is a cultivated form of *Andropogon sorghum*.

BROTHER JONATHAN, a popular personification of the United States, or rather, of its people, collectively. Various accounts of its origin are given, but the most likely one is traced back to George Washington and his friend and adviser, Jonathan Trumbull. Trumbull, governor of Connecticut during the Revolutionary War, was so wise a counselor that Washington was frequently heard to say in times of uncertainty, "We must ask Brother Jonathan." The remark at length became a proverb, the name losing its first meaning and broadening to include the whole people. It always kept more than a hint of its most favorable significance, however, for *Brother Jonathan* represents only the broad-minded, trustworthy

phase of the national life. Other very familiar personifications, which differ in that they represent not the people but the nation as a political whole, are *John Bull* for England, *Uncle Sam* for the United States, and *Johnnie Crapaud* for France. See BULL, JOHN; TRUMBULL, JONATHAN; CONNECTICUT (History).

BROWN, a color obtained by the mixture of black, red, and yellow. A large number of shades and tints may be produced by mixing in varying proportions, and by adding other colors, a still greater variety is obtainable. There are various brown coloring matters, most of them being mineral pigments; umber and sepia are good examples. See COLOR. A.L.F.

BROWN, CHARLES BROCKDEN. See AMERICAN LITERATURE.

BROWN, HENRY KIRKE (1814-1886), an American sculptor, noteworthy in the days when the United States was finding for itself a place among the producers of art. Especially well known are his *Indian and Panther*, the first bronze sculpture cast in the United States; statues of Winfield Scott, Nathanael Greene, De Witt Clinton, and Lincoln; and, finest of all, the equestrian statue of Washington, in Union Square, New York. Few of the equestrian statues produced by later sculptors outrank this.

Brown was born at Leyden, Mass. He studied first in Cincinnati, and from 1842 to 1846 in Italy; but though it was there that he became master of his art, he never ceased to oppose Italian influence and to strive for something more truly national. At the outbreak of the War of Secession, he was engaged on a group of figures for the state house in Columbia, S. C., which he was obliged to leave unfinished.

BROWN, JOHN (1800-1859), one of the most extreme of American abolitionists, whose name still lives in the widely sung

John Brown's body lies a-mouldering in the grave
But his soul goes marching on

Brown was born at Torrington, Conn., of *Mayflower* ancestry, and spent the years of his young manhood in aimless wanderings, living at various times in Connecticut, Ohio, and New York. He married early in life, and unwilling to learn any trade, he earned but a scanty living for his twenty children. When the Kansas-Nebraska Bill was passed, permitting the Kansas settlers to decide whether the state should be slave or free territory, enthusiasts from both factions thronged to the state, and among the strongest of the free-state men was Brown. In the fierce warfare which was carried on for several years in Kansas and Missouri, he proved an expert fighter, and his victory over a band of Missourians at Osawatimie won him the popular name of "Osawatimie Brown."

But he was not content with resistance of this nature; he had formed an aggressive plan

to free the slaves, and on the night of October 16, 1859, attempted to put it into effect. With about a score of followers, he descended upon Harper's Ferry, in West Virginia, and seized a national arsenal, believing that the result would be an immediate rising of the slaves. No such thing occurred, however, and within a day or two United States troops under Robert E. Lee, later the great leader of the Confederate armies, regained possession of the arsenal and took as prisoners Brown and such of his followers as had not fled. The leader was tried at Charleston, convicted of treason, and on December 2, 1859, was hanged.

Intense was the excitement which the insurrection kindled; the South naturally looked

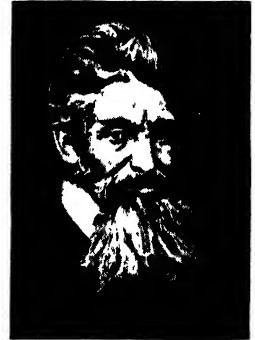


Photo U & U

JOHN BROWN



Photo Visual Education Service

JOHN BROWN'S "FORT"

An engine house at Harper's Ferry which Brown held and later lost to Colonel Robert E. Lee, commanding government forces

upon Brown as nothing less than a criminal, while many in the North, even including some of the more temperate abolitionists, regarded him as a martyr to conscientious, if mistaken, enthusiasm. The Harper's Ferry insurrection had no immediate consequences of great importance, but the fact that it was condoned in the North made the South more determined in its defense of slavery, and it was one of the indirect causes of the War of Secession (which see). See, also, ABOLITIONISTS.

BROWNE, CHARLES FARRAR (1834-1867), an American humorist who, under the name of ARTEMUS WARD, became one of the most popular lecturers of his day. He was born in Waterford, Me., and had to begin his career

with very little schooling, as he was his mother's only support. His first position was that of typesetter in a printing office; then he became a reporter, and, finding that the anecdotes he printed were widely quoted, decided to make use of them on the lecture platform.

He was accustomed to say the most absurd things with an air of solemnity, and his unexpected turns and ridiculous puns immensely pleased his audiences. "Africa is famed for its roses," he would say. "It has the red rose, the white rose, and the neg-roses"; or, "If spring is some, June is summer." Often he would give such sound advice as "Always live within your income, if you have to borrow money to do it"; and he admonished the Prince of Wales to be as "good a man as his mother was." The lectures of Artemus Ward, in book form, with their designedly impossible spelling and grammar, preserve the best sayings of this humorist, but do not excite the mirth they did when the lecturer's personality made them the best of their kind.

BROWNIE, a fairy-like creature in Scotland's superstitions, formerly believed to haunt houses, particularly farmhouses. It was assumed that he was very useful to the family, particularly to good servants, for whom he merrily did many acts of drudgery while they slept. If offered food or pay for his tasks, he disappeared, and never came again. The brownie bears a close resemblance to the Robin Goodfellow of England and the Kobold of Germany.

[Many stories have been woven about this little elf. The best known and most popular are the *Brownie Books* of Palmer Cox, the American artist and writer for children.]

BROWNING, ELIZABETH BARRETT (1806-1861), considered by competent critics the greatest woman poet that England has produced. Her marriage to one of the most eminent poets of his day did not lead to the eclipse of her genius by his, but rather to the strengthening of both (see **BROWNING, ROBERT**).

Elizabeth Barrett, born at Coxhoe Hall, in Durham, grew up at Hope End, in Herefordshire, where she spent a most happy childhood. Some of her poems, written years later, show that her joy in the beautiful out-of-doors about her in her girlhood remained with her all her life. She was never very strong, but her mind was alert and vigorous, and she found pleasure in reading that would be far too difficult for most children. Very early she began to write poetry, but of these early poems she was ashamed in her later years. When she was about twenty, however, she published a little volume, *An Essay on Mind, and Other Poems*, and from that time her rise to recognition was steady.

After about 1835, when the family moved to London, she was an invalid and was confined to

her room, but her letters show her to have been possessed of a cheerful, gallant spirit. In 1838, however, there occurred a tragedy in her life. from the shock of which she never fully recovered. Her favorite brother was drowned while at Torquay with her, and for a time it seemed as if her life, too, would be sacrificed. But she

rallied, and began to produce poems again, some of her best-known works, as *The Cry of the Children* and *Lady Geraldine's Courtship*, coming from her sick room. A reference to Robert Browning in this latter poem led to an acquaintance which grew into mutual love, and in 1846 the two were married. The union was unusually happy, her only grief being that her father was opposed to it, and never forgave her. From the time of their marriage, the poets lived in Italy, where Mrs. Browning's health was far better than in England. She died in Florence, and was buried there.

Her greatest work, in the opinion of most critics, is the *Sonnets from the Portuguese*, which bear comparison with the finest sonnets in the English language, and perhaps surpass all others which deal with the same subject; for they are love sonnets, recording the growth of her love for Browning and his for her. Written during her engagement, they were not shown even to Browning until after their marriage, and then he insisted upon their publication, allowing the use of the words *From the Portuguese* simply as a disguise. Mrs. Browning's longest work, and the one she herself ranked highest, is the narrative poem, *Aurora Leigh*. While not autobiographical in its story features, it aimed to present a picture of Mrs. Browning's ideals and beliefs.

BROWNING, ROBERT (1812-1889), one of the most distinguished and original thinkers that England has produced. Some critics hold that he is more philosopher than poet, but such an opinion fails to do justice to the musical quality of much of his verse, as well as to his truly inspired poetic touches. Could it be said that the man is not a poet who wrote such lines as—

Oh lyric love, half angel and half bird,
And all a wonder and a wild desire,

Some unsuspected isle in far-off seas.



Photo Brown Bros

ELIZABETH BARRETT
BROWNING

That's the wise thrush; he sings each song twice over
Lest you should think he never could recapture
The first fine careless rapture.

And yet it is not for smooth, liting lines that Browning is best known and best loved, but for the strength and optimism that show through his rugged verse—an optimism that is far from being mere placid acceptance, but sees the good in man, despite what is evil.

Early Life. He was born in Camberwell, a suburb of London, on May 7, 1812, and grew up amid pleasant surroundings. His father and his mother were in sympathy with his aspirations, and seem to have known how to direct his education so as to bring out the best that was in him. The fact, too, that he inherited perfect health had much to do with his pure physical enjoyment of life, which he so often expressed in his poems, as in the lines from *Saul*:

How good is man's life, the mere living! how fit to
employ
All the heart and the soul and the senses forever in
joy!

He studied under tutors, and for a brief time at University College in London, but most of his education came from the books which surrounded him from his childhood. In all his works, there is evident a very wide acquaintance not only with the literature that everyone reads, but with obscure works that come within the reach of comparatively few. This accounts for the difficulty many experience in reading some of his poems. They are filled with allusions to facts and fancies which only a person as widely read as Browning could hope fully to understand. Travel on the Continent did much to broaden his outlook on life and to convince him that his early attempts at writing poetry were feeble and immature. The works of Keats and Shelley were a genuine inspiration to him, and confirmed him in the desire to devote his life to poetry, shortly after his return to his native land.

Marriage with Elizabeth Barrett. In 1844 Browning became acquainted with Elizabeth Barrett through calling on her to thank her for a compliment she had paid him in one of her poems. Friendship grew into love, and in 1846 they were married. Their life together was very beautiful, and her death in 1861 was a shock from which Browning never completely



ROBERT BROWNING

recovered (see BROWNING, ELIZABETH BARRETT). He moved from Italy, where all his married life had been spent, to England, that he might educate his son. In England, he was very popular socially. Later, however, he returned to Venice, where he died. His body was taken to England, and was buried in Westminster Abbey.

As a Poet. From the time his first poem appeared, in 1832, he wrote rapidly, revising little. He seemed unable to rewrite his work, and this probably kept him from attaining the faultless form which distinguishes Tennyson's poetry. The form which he adopted, however, rugged as it is, fits far better the content of his poems than would more smoothly flowing measures. At times, his lines have all the swing desired by the most music-loving reader, as, for instance, these lines:

Just for a handful of silver he left us,
Just for a riband to stick in his coat.

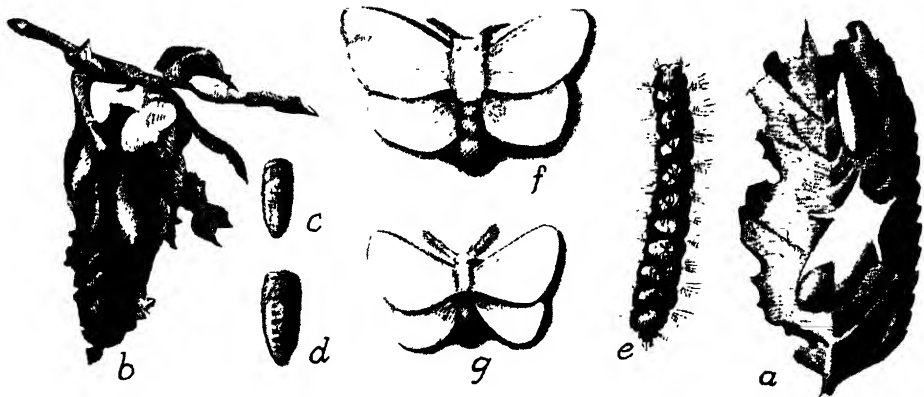
To Browning, the most fascinating of all studies was the human mind, and he was able to analyze it and to describe its experiences as perhaps no other English poet except Shakespeare has ever been able to do. His genius was distinctly dramatic, and had he lived in an age when the drama was the chief form of literary expression, he might have done his best work in that field.

His Works. He brought the dramatic monologue to a high point of perfection, such poems as *My Last Duchess*, *Andrea del Sarto*, *The Bishop Orders His Tomb at Saint Praxed's*, *Fra Lippo Lippi*, and *A Forgiveness* showing him at his best. *The Ring and the Book*, considered by many critics his masterpiece, is a series of monologues forming one great poem. Besides the poems mentioned above, his best-known works are the dramas, *A Blot on the 'Scutcheon*, *In a Balcony*, *Pippa Passes*, and *Colombe's Birthday*; *Saul*, *Rabbi Ben Ezra*, and the poems comprised in the collection called *Men and Women*. Browning is for the most part distinctly not a children's poet, but such ringing dramatic poems as *An Incident of the French Camp*, *How They Brought the Good News from Ghent to Aix*, *The Pied Piper of Hamelin*, and *Herne Riel* will appeal to any boy who likes war and action.

BROWN ROT. See PEACH (Enemies).

BROWNSVILLE, TEX. See TEXAS (back of map).

BROWN-TAIL MOTH, a serious pest on fruit and shade trees in the New England states. It was accidentally brought into Massachusetts from Europe, about 1892, and soon spread through the neighboring states and into Canada. The moths have pure-white wings; they are called brown-tailed in allusion to a bunch of brown hair at the tip of the abdomen of the female. With wings outspread, the female moth is one and one-half inches across, the male being slightly smaller. On mornings during the flying season, hundreds



BROWN-TAIL MOTH

- (a) Egg mass and moth laying egg
(b) Winter nest
(c) Male pupa
(d) Female pupa

- (e) Full-grown caterpillar
(f) Female moth
(g) Male moth

of these moths can be seen collected on poles or posts near electric lights, whence they scatter to trees.

During the first three weeks in July, the female deposits her eggs—about 250 of them—under the tip of a leaf. About fifteen or twenty days later, they develop into destructive caterpillars; these are an inch and a quarter long when full-grown, with a wavy line of light spots on each side of the back and two red spots at the end. The barbed hairs contain a poison which causes a burning itch when it touches the skin.

The young caterpillars feed on the outer coat of leaves, and they also eat into apples and pears. In October they spin their winter webs—grayish silk nests—including also several leaves, and so, attached to twigs, they stay until April. The greatest damage is done in the spring by the hungry caterpillars emerging from the nests. The destruction of these nests in the winter by removal and burning is the best means of exterminating the moths. Spraying or dusting the foliage with arsenate of lead will destroy the caterpillars and protect the tree.

W.J.S.

Scientific Name. The brown-tail moth is classed as *Euproctis chrysorrhæa*. It belongs to the family of tussock moths, *Lymantriidae*. See TUSOCK MOTH.

BROWN THRASHER, often incorrectly called *brown thrush*, is a handsome, reddish-brown bird, about eleven and one-half inches long. It has a long tail, which it thrashes about to show its emotions; from this characteristic the name is derived. Its breast is speckled with white; its bill is long, and curved at the tip; its eyes are yellow. During spring and summer, in all parts of the United States and Southern Canada east of the Great Plains, it sings in gardens and orchards and from

roadside fences, in notes not much inferior to those of the mocking bird. It is a good mimic. In the early morning or evening, it perches in the top of a tree and sings sometimes for an hour or more. It nests in shrubbery and brush piles, or on the ground, and lays three to six grayish or greenish eggs, dotted with reddish-brown. Not only is the brown thrasher a joy to the ear and eye, but it is a help to the gardener, for in return for the few berries it takes, it feeds on a host of insects which would be harmful to plants.

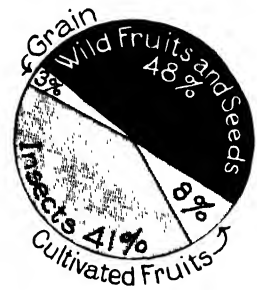
D.L.

Scientific Name. The brown thrasher belongs to the same family as the mocking bird, *Mimidae*. It is classed as *Toxostoma rufum*.

BROWN THRUSH. See BROWN THRASHER; for the poem *The Brown Thrush*, see LANGUAGE.

BROWN UNIVERSITY, one of the comparatively few institutions of higher learning in the United States which date back to colonial days. It was chartered in 1764 at Warren, under the name of Rhode Island College, but was transferred in 1770 to Providence. In 1804 it was rechristened Brown University, in honor of Nicholas Brown, a generous benefactor. Though non-sectarian in spirit, the university owes its origin to the Baptists, and the president as well as a majority of the board of fellows and the board of trustees must be Baptists.

During the early and middle part of the



nineteenth century, the scope of the institution was greatly enlarged. President Francis Wayland (1827-1855) introduced the elective system, laying stress on the hitherto neglected sciences, and emphasizing graduate work. The John Carter Brown Library has the largest collection of early Americana in the world.

In 1891 a Woman's College was founded, and six years later it was accepted by the trustees as the Women's College in Brown University. This branch of the university has its own buildings and its own courses.

BRUCE, JAMES. See AFRICA (History: The Explorers).

BRUCE, ROBERT (1274-1329). This gallant Scottish king spent a large part of his life in the effort to free his country from English rule. The oft-told incident about Bruce and the spider is said to have occurred during the darkest days of that struggle.

While a fugitive, Bruce lay one morning on his hard bed in a wretched hut, and saw on the roof above him a spider swinging by a thread of its own spinning. It was trying to swing itself from one beam to another, and again and again made the attempt in vain. When it had tried six times, Bruce realized that that was just the number of battles which he had vainly fought against the English, and he made a vow that if the spider tried a seventh time and succeeded he would renew his courage and try again. The spider's seventh attempt was successful, and Bruce took heart and went forth to victory.

Early in his career, Bruce, then Earl of Carrick, swore allegiance to Edward I, king of England, and though he occasionally changed sides and aided the patriot William Wallace (which see), he managed to maintain friendly relations with Edward until 1306. In that year in a quarrel he killed "Red Comyn," a claimant to the Scottish throne, and immediately afterward assembled his vassals and had himself crowned king at Scone. Defeat at the hands of the English followed, and late in the year he dismissed his troops, retired to the Irish coast, and let his enemies think him dead. In the following spring, however, he landed in Carrick, defeated the English, and within two years had almost all Scotland in his possession.

He then advanced into England, laying waste the country, and in 1314 he defeated the English in a famous battle at Bannockburn, as the latter were advancing under Edward II to the relief of the garrison at Stirling. For years hostilities continued at intervals, with occasional treaties which did not establish peace; it was not until 1328 that England finally recognized Scotland's independence and the right of Bruce to the throne. Bruce did not live long after the completion of his great

work, but died in 1329 of leprosy. His son David succeeded him. See EDWARD (England); SCOTLAND (History: Struggle for Independence).

BRUGES, broo' jez. See BELGIUM (The Cities).

BRULE, brool, ETIENNE. See MICHIGAN.

BRUMBY, LIEUTENANT, first man to raise the American flag at Manila. See ATLANTA (Georgia).

BRUMIDI, broo mid' ic, CONSTANTINO, painter of the *Apotheosis of Washington*. See WASHINGTON, D. C.

BRUMMELL, brum' el, GEORGE BRYAN (1778-1840), generally known as BEAU BRUMMELL, an English man of fashion who for twenty-one

years set the London taste in dress and manners and yet died miserably in an asylum for the poor. At the age of sixteen he gained the friendship of the Prince of Wales, afterward George IV, who made him an officer in his own regiment of the Tenth Hussars, and showed him flattering attention during the period when Brummell, prosperous and admired, lived handsomely on the fortune that had been left him by his father.

Brummell was not a fop, he was fastidious about his appearance, but dressed, as Lord Byron said, "with exquisite propriety." A long course of extravagant living, however, brought him heavily into debt, and in 1816 he fled to Calais, in Northern France, to escape his creditors. Thereafter he was dependent on the generosity of his friends, growing poorer from year to year, and dying wretchedly in Caen, France, where for a brief period he had held the position of consul.

["Beau Brummell" was dramatized for Richard Mansfield, and for the moving pictures, with John Barrymore in the title rôle.]

BRUNELLESCHI, broo nel les' ke, FILIPPO (1377-1446), the real founder of the architecture of the Renaissance (which see). He was born in Florence, but went to Rome with Donatello to study his chosen art. While there, he evolved the idea of bringing architecture back from the Gothic style to the principles of Greece and Rome. In this he was successful, as his work opened the way for Bramante and others, but he never freed himself entirely from the traditions of medieval art. In 1417



Photo - Brown Bros

"BEAU BRUMMELL"

he removed to Florence, where he lived the rest of his life.

A Great Accomplishment. His greatest work was the dome of the Cathedral of Saint Mary, which he erected despite warnings from other architects as to its impossibility. It has remained unsurpassed, for the dome of Saint Peter's, though greater in height, is inferior to it in massiveness of effect. Among other important works by him were the Pitti Palace at Florence and the Pazzi Chapel at Santa Croce.

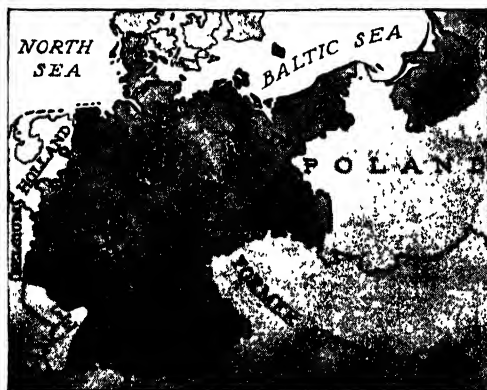
BRUNHILDE, *broon' hilt*, in Norse mythology. See SIGURD; NIBELUNGENLIED.

BRÜNN, or **BRNO**, as known in Europe. See CZECHOSLOVAKIA (Principal Cities).

BRUNSWICK. See GERMANY (Principal Cities).

BRUNSWICK, a former duchy of the German Empire, proclaimed a republic in 1918, and now a part of the German republic. According to the constitution adopted in 1922, there is a Diet of forty-eight members and a Cabinet of three.

Brunswick, with an area of 1,418 square miles, a little greater than that of Rhode Island,



THE FORMER DUCHY OF BRUNSWICK
In black

is surrounded by the Prussian provinces of Hanover, Saxony, and Westphalia. The northern part, though hilly or rolling, nowhere reaches any considerable altitude, but the southern part contains a portion of the Harz Mountains system, and rises in places to heights of more than 3,000 feet. Deposits of iron ore, lead, copper, asphalt, and lignite are found, but the mining industry is far surpassed in importance by agriculture. About one-half of the land is capable of tillage, and the leading crops are grain, potatoes, sugar beets, and fruit. The manufacturing industries include brewing, distilling, and the making of linens and woolens, hats, chemicals, and beet sugar. Population, 1925, 501,875.

BRUNSWICK, FAMILY OF, a distinguished family of which a younger branch furnished to Great Britain its present line of rulers. The

House of Brunswick was founded in the twelfth century by the famous Henry the Lion, a rebellious vassal of Frederick Barbarossa (which see). Much of his territory was lost to him in conflict with his emperor, but he continued to hold Brunswick and Lüneburg, and it was his grandson, Otto the Child, who in 1235 was given the title of first Duke of Brunswick.

By the two sons of Ernst the Confessor, who became duke in 1532, the family was divided into the two branches of Brunswick-Wolfenbüttel and Brunswick-Lüneburg (House of Hanover), and it was a representative of this latter branch who became king of Great Britain as George I in 1714, his claim being based on the fact that he was the son of a granddaughter of James I of England. The Brunswick-Wolfenbüttel family was in possession of the duchy of Brunswick until the death of the last duke in 1884, and after that, years of conflict and of regency followed. In 1913 the difficulties were settled, and Ernst August, son of the Duke of Cumberland and son-in-law of the emperor of Germany, was made Duke of Brunswick. He was a member of the Brunswick-Lüneburg line.

BRUNSWICK, GA. See GEORGIA (back of map).

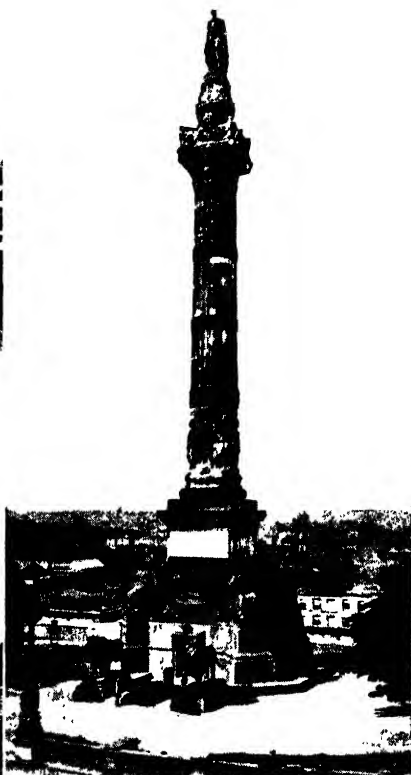
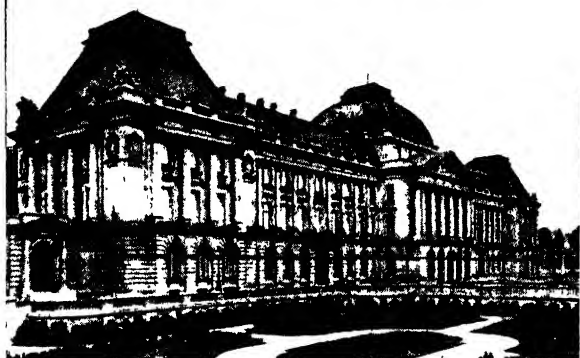
BRUSA, *broo' sah*. See TURKEY (The Cities).

BRUSH, CHARLES FRANCIS (1840-1920) an American electrician, the inventor of the Brush dynamo for arc lighting. He also invented an electric lamp and a large number of devices which greatly improved the electric light. He was born at Euclid, O., and was graduated at the University of Michigan in 1869, with the degree of mining engineer. For his achievements in electrical science, he was awarded the Rumford medal by the American Academy of Arts and Sciences, and honored by election to membership in the French Legion of Honor. See ELECTRIC LIGHT.

BRUSH TURKEY. See MOUND BIRD.

BRUSSELS, *brus' elz*. Because of its wide boulevards, its beautiful buildings, the animated appearance of its streets, and its reputation as a center of art and learning, this fine old capital of Belgium has been given the popular name of "Little Paris." It is situated near the center of the country, twenty-seven miles by rail south of Antwerp.

Special Features. The city consists of a lower town and an upper town. The lower town, containing the older parts, and devoted now almost entirely to commerce and industry, is surrounded by a circle of wide boulevards which have been built on the site of the old walls of the city. The upper town, partly inside and partly outside the boulevards, is the finest part, and contains the king's palace, the government offices, wide streets, beautiful parks, and modern residential quarters. The



In Historic Brussels. Upper left, the Bourse, or Exchange. Below it, the palace of the king. Upper right, a column erected to the Assembly which founded Belgium. Lower left, a government building. Lower right, Saint Gudule's Church; the towers date from the fourteenth century.

chief point of interest in the lower town is the famous Grande Place, which is probably the most splendid example of a medieval market square still left in Europe.

On one side of this square is situated the beautiful town hall (Hôtel de Ville), dating in part from the fifteenth century; it is an imposing Gothic structure, with a spire 364 feet in height. Here also are situated the corporation houses of various medieval guilds, which lend a special charm to the square, on account of their medieval architecture and ornament. Another important ancient building is the Church of Sainte Gudule, begun in 1220, and considered one of the finest specimens of pointed Gothic architecture. One of the most magnificent buildings in Europe is the Palace of Justice, built between 1866 and 1883, which crowns the highest point in the city.

Brussels is the intellectual center of the country; it possesses a university, recently enlarged, academies of science, fine arts, and music, and a celebrated picture gallery. Many of the most valued pieces of art were hurriedly removed from the city in 1914 upon the approach of the Germans (see below), but these have since been restored.

Industries and Transportation. Brussels for centuries has been celebrated for its manufacture of lace. More modern manufactures include cotton and woolen goods, curtains, paper, and articles of bronze; there are also breweries, distilleries, sugar refineries, and foundries.

The city is connected by railways and canals with all parts of the country, and has direct communication with the sea through the Willbroek Canal, which connects it with the Rupel River, not far from its confluence with the Scheldt.

History. Brussels appears to have been founded in the sixth century. From the tenth century, it began to develop its trade and industry, and various trade guilds similar to those of Ghent were formed here (see GUILD). It became the capital of the Austrian Netherlands in 1477, and under the fostering care of several of the Hapsburg governors was for a long time one of the pleasantest capitals in Europe.

It was captured in 1794 by the French, who retained it till 1814. Near Brussels is the scene of the famous Battle of Waterloo. The city was a part of the kingdom of the Netherlands until 1830, when Belgium separated from Holland and made Brussels its capital.

During the World War, Brussels was occupied by the Germans, having surrendered without a battle in order to save its beautiful buildings from bombardment. The city was forced to pay heavy tribute to the conquering forces, but was preserved thereby practically intact. Population, 825,000. See BELGIUM.

BRUSSELS SPROUTS, a cultivated variety of cabbage, originating in Belgium. The "sprouts" are enlarged buds formed in the

axils of the leaves, and are prized for their distinctive and delicate flavor. When prepared for the table, they are usually cooked in boiling salted water and served with melted butter or with a sauce. Brussels sprouts require a long, cool growing season, with plenty of moisture. They are harvested in the fall, and can be kept over winter, if stored in a cellar in moist sand. An important point in their cultivation is to give the growing heads plenty of room. When they begin to crowd one another, the lower leaves should be broken off, but a few leaves should always be left at the top, where new heads are forming.

B.M.D.

Scientific Name. Brussels sprouts are a form of cabbage, *Brassica oleracea*. The scientific name of the cabbage family is *Cruciferae*.



BRUSSELS SPROUTS

BRUTUS, *broo' tus*, MARCUS JUNIUS (85-42 B.C.), a distinguished Roman, in the forefront of the conspiracy against the life of Caesar. He fought with Pompey against Caesar, but when Pompey was defeated at Pharsalia, he was pardoned by Caesar, who made him governor of that part of Gaul lying south of the Alps. Although Caesar had thus befriended him, Brutus allowed himself to be drawn into the great conspiracy, and actually was one of those who raised a dagger against Caesar. (See page 1068).

When Mark Antony, with his ironic "And Brutus is an honorable man," had roused the people to fury in his oration over the dead body of Caesar, Brutus took refuge in the East, and raised a large force in Greece and Macedonia. With Cassius, he met Antony and Octavius (later the great Augustus) at Philippi, but when the battle went against him, he committed suicide by falling on his sword.



BRUTUS
[A sculpture by Michelangelo.]

Shakespeare's Tragedy. Shakespeare in his *Julius Caesar*, of which Brutus is really the hero, has given a more favorable picture of him than most historians sanction. His defense of his action in helping to kill Caesar is one of the most famous speeches in all Shakespeare's works. It concludes with the words:

"As Caesar loved me, I weep for him; as he was fortunate, I rejoice at it; as he was valiant, I honor

him; but as he was ambitious, I slew him. There is tears for his love; joy for his fortune; honor for his valor; and death for his ambition."

Related Subjects. The reader is referred in these volumes to the following articles:

Antony, Mark
Augustus

Caesar, Caius Julius
Rome (History)

BRYAN, WILLIAM JENNINGS (1860-1925), an American orator, statesman, journalist, and political leader, three times an unsuccessful candidate for President of the United States, and for many years acclaimed the "Peerless Leader" of the Democratic party.

When Bryan first became a national figure, he was thirty-one years old. He had just been elected to the House of Representatives from a Nebraska district, and his fame as the "boy orator of the Platte" accompanied him to Washington. There he was given the unprecedented honor of membership on the Committee on Ways and Means during his first term.

Early Career. Bryan was born March 19, 1860, at Salem, Ill.; was graduated from Illinois College, at Jacksonville, in 1881, and later was a law school student in Chicago. In 1884 he married Miss Mary Baird, who was later graduated in law, and to her he gave credit for frequent advice on both legal and political questions. After he had practiced law in Jacksonville for four years, the family moved to Lincoln, Neb., where he quickly became a leader of the bar and a popular Democratic campaign orator.

The First Nebraska Congressional District, normally a Republican stronghold, sent him to Washington in 1891. Bryan was a hard worker, and he forced recognition for himself in the discussions on the tariff and free silver. His advocacy of the unlimited coinage of silver at the ratio of 16 to 1 found no favor with his Republican constituents, who refused to elect him for a third term, and also defeated him for the office of United States Senator. He then became editor of the Omaha *World-Herald*, and continued to advocate free silver, both in his paper and on the public platform, for he was in demand as an orator.

Three Campaigns for the Presidency. In 1896 Bryan was an alternate delegate to the Democratic national convention at Chicago

and became a member upon the withdrawal of a regular delegate. He wrote the plank of the platform declaring for free silver, and during a heated debate which lasted for seven hours, he swept the convention off its feet by a great oration, closing with these words:

We shall answer their demand for a gold standard by saying to them: You shall not press down upon the brow of labor this crown of thorns! You shall not crucify mankind upon a cross of gold.

The speech won him the nomination for President. In the campaign that followed, Bryan traveled over 18,000 miles and delivered over 600 speeches in twenty-seven states—a record number. The story of the campaign was told in his book, *The First Battle*. The election resulted in the choice of McKinley, the Republican candidate. Again, in 1900, Bryan was defeated by McKinley, after a campaign almost as exciting as that of 1896. After this second defeat, Bryan founded *The Commoner*, a journal published at Lincoln, in which he continued to advocate his political views. In 1904 he did not seek the nomination, but bitterly opposed the conservative stand taken by the convention and its repudiation of his principles.

In 1905 and 1906 he made a tour of the world, and was everywhere received with many honors. The decisive defeat of Parker in the 1904 election turned the Democrats again to Bryan, who was mentioned as a candidate for President as soon as he returned to the United States. He was nominated in 1908, but was defeated by William H. Taft. In 1910 he was all but repudiated by the Democratic convention of his own state; every candidate whom he supported was defeated for nomination.

Still a Leader. In the Democratic national convention at Baltimore in 1912, the most conspicuous figure was this man, now past middle age, head still unbowed after successive defeats and numerous attempts at denial of his leadership. But in that convention his followers held the balance of power, and with all of his old-time vigor he denounced several candidates as agents of "reaction" and "predatory interests." Amid great confusion, he finally dominated the convention, forced the nomination of his Presidential candidate, and wrote into the platform the planks he wanted. The successful candidate was Woodrow Wilson.

Grateful for the help of Bryan at the critical moment in the convention, Wilson appointed him as Secretary of State, the premier Cabinet post. It was an unhappy choice, considering world events. Bryan was perhaps the leading pacifist in a nation faced with a war overseas, which was creeping daily nearer to American shores. After the sinking of the *Lusitania*, he disapproved of strong condemnatory notes to Germany demanding recognition

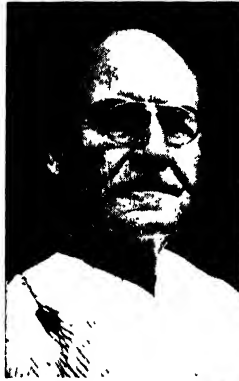


Photo: U & U

WILLIAM JENNINGS BRYAN
Three times an aspirant for the Presidency of the United States, the second so-called "Great Commoner" in American history

of American rights on the high seas; he declared that America should not enter upon war as long as he held the portfolio of State. He and the President held views so divergent that his resignation was inevitable. During his period of office in the Department of State, he negotiated thirty treaties with foreign powers which provided for submission of international disputes to impartial investigation and a year's delay before commencement of hostilities, in order that arbitration might be invoked to settle matters at issue.

When he retired from the Department of State, he put behind him hopes of future political preferment, but endeavored to retain his hold upon his party in competition with new and ambitious leaders. At the national convention of the Democrats in New York in 1924, it was Bryan who was foremost in the factional strife of that memorable meeting. In pleading for his ideals, he stated that this was probably the last national convention he would attend. When his enemies applauded the statement, he retorted, "Don't cheer; I may change my mind!"

Two causes in that stormy convention nearly wrecked the party. Bryan led the faction which demanded a strong prohibition plank in the platform; the proposal was defeated. He opposed the adoption of a resolution denouncing the Ku-Klux-Klan by name, and by one vote (542 to 541) the Klan was spared this humiliation.

In that convention, Bryan was opposed to the candidacy of Governor Alfred E. Smith of New York, and to that of John William Davis, because of his corporation affiliations. Davis was nominated after more than a hundred ballots had been taken. So devoted was Bryan's following even in the latter days of his career that the political managers could not afford to lose his support of the ticket in the campaign; it was a tribute to his strength when his brother Charles, governor of Nebraska, was named for Vice-President as the running mate of Davis. The political strategy thus employed restrained Bryan from open denunciation of the platform and nominees. This marked the end of his political career.

Bryan's Life in Florida. His power was beginning to wane five years before the 1924 convention. Nebraska would offer him nothing more of promise, so in 1920 he left that state and established his legal home in Miami, Fla. Two years later, Bryan's friends made an ineffectual attempt to send him to the United States Senate from the Southern state; there was no popular response to the proposal.

Real-estate operations in the state of his adoption augmented the already ample fortune of Mr. Bryan, and his last years were unclouded by anything more serious than reflections upon the great and unsatisfied ambitions

of his life. He could, however, dwell with pride and pleasure upon the fact that for sixteen years he had been master of his party.

Temperance Advocate and Lecturer. Bryan's courage in advocating policies which seemed to him right and just was strikingly illustrated by his outspoken stand for prohibition of the liquor traffic. In this he assumed no halfway position, but definitely took his place in the ranks of those who were working to legislate out of existence the sale of intoxicating liquors.

As a lecturer, he was probably known to more people than any other public man of his time, and no other speaker won more enduring popularity on the Chautauqua circuits. The quality of his oratory was often described as "silver-tongued." Never at a loss for a telling phrase or for words to express his thoughts, he captivated his audiences by his splendid delivery, his graceful flow of language, and his earnestness and sincerity. His greatest effort, *The Prince of Peace*, was a masterpiece of American oratory.

His Last Great Fight. Bryan was a devout churchman, and a storm center in religious controversies. He was a Fundamentalist, accepting the Bible in its entirety as the Inspired Word, and he had no patience with liberal thought. When John Scopes, a Tennessee educator, was arrested for teaching evolution in the public schools, contrary to a state statute, Bryan was announced as the leader of the prosecution. In the verdict of the jury, the statute was upheld; Scopes was found guilty.

He remained in Dayton, the scene of the trial, to rest after the exciting days through which he had just passed, and died there, July 26, 1925.

The Burial. The great apostle of peace was given a soldier's burial, for in the Spanish-American War he had held a commission as colonel of volunteers, and as such was entitled to burial in the National Cemetery at Arlington. There he was laid to rest. E.D.F.

Related Subjects. The reader is referred in these volumes to the following subjects

Bimetallism	McKinley, William
Evolution	Wilson, Woodrow

BRYANT, WILLIAM CULLEN (1794-1878), known as the "Father of American poets," because he was the first one to rise to eminence. Though he has never been so popular and beloved as Longfellow, certain of his poems, as *Thanatopsis*, *To a Waterfowl*, *The Death of the Flowers*, and *To the Fringed Gentian*, are as well known as anything else in the nation's verse; they have given inspiration as well as pleasure to millions of people.

Events of His Life. Bryant was born at Cummington, Mass., the son of a country doctor. From his childhood, his inclinations were toward literature, and he spent in reading

and study much of the time which most boys devote to play. This does not mean that he had no amusements, for he has left an account of snowball fights, of dam-building, and of races in which he used to join the other children. When he was ten years old, a country newspaper accepted one of his poems, and three years later his satiric poem, based on the celebrated Embargo Act (which see) and addressed to President Jefferson, attracted attention. In 1810 he entered Williams College, but after a year gave up the idea of a college course, and began the study of law. He was admitted to the bar in 1815, and practiced for ten years, most of the time at Great Barrington, Mass. Before he left that town, in 1825, he was married to Miss Fairchild.



WILLIAM CULLEN BRYANT

Meanwhile, when but seventeen years old, he had written *Thanatopsis*, the first great poem produced in America. He left it carelessly among some papers, but six years later his father discovered it and sent it to the *North American Review*. Its appearance aroused much discussion, some European critics going so far as to assert they did not believe any American could have written it. Possibly the most frequently quoted words of the poem are these:

So live, that when thy summons comes to join
The innumerable caravan, which moves
To that mysterious realm where each shall take
His chamber in the silent halls of death,
Thou go not, like the quarry-slave at night,
Scourged to his dungeon, but, sustained and soothed
By an unfaltering trust, approach thy grave,
Like one who wraps the drapery of his couch
About him, and lies down to pleasant dreams.

The same periodical afterwards published other works of his, and he was well known as a poet and literary critic before he moved to New York, in 1825. For three years he served as associate editor of the New York *Evening Post*; then for over a half century he was editor-in-chief of that paper, becoming a notable figure in municipal affairs.

Place as a Poet. As has been emphasized above, Bryant's position in his chosen field is unique. The nation had produced only one great prose writer before him—Washington Irving—but no poet; Bryant's verse was the model for America until the coming of Longfellow. Frequently those whose genius flowers as early as did Bryant's show a decided decline in their later work, but he remained produc-

tive and progressive to the last. Above all, he was the poet of nature, in whose beauties he found inspiration. Thus his poems usually close with a moral, always so truly an outgrowth of what has preceded that the artistry remains. If Bryant was cold and removed from human sympathy, as Lowell charged in his *Fable for Critics*, it was due merely to his dignity and serenity, and not to any lack of ability to feel.

Place as an Editor. As an editor of one of the great papers of the largest city in the United States, Bryant attained distinction. His editorials were plain, straightforward, and convincing, and they exercised a strong influence in their day. Many of the reforms which he had advocated Bryant lived to see firmly established, and he rejoiced particularly in the downfall of slavery.

Other Works. Besides the short poems mentioned above, for which he is chiefly famous, Bryant published translations of the *Iliad* and the *Odyssey*, *Letters of a Traveler*, *Letters from the East*, and *Orations and Addresses*.

BRYCE, JAMES, VISCOUNT (1838-1922), a British historian, publicist, and statesman, author of *The American Commonwealth*, a book accepted as the best existing analysis of political institutions in the United States. Not without justice Bryce has been called the "unofficial interpreter of the United States to Great Britain." For five years, from 1907 to 1912, as British ambassador at Washington, he was as well the official interpreter of Great Britain to the United States. No other man has contributed more to the perpetuation of friendly relations between these two countries. This unique service was but a small part of Bryce's activities.

He was born on May 10, 1838, at Belfast, Ireland, where his father was for many years head master of a school. Inclination led the son back to Glasgow, his father's old home. After completing his course in the University of Glasgow, he was graduated at Trinity College, Oxford, in 1862. In 1867 Bryce was called to the bar, and only three years later, in 1870, was given the important position of Regius Professor of Civil Law at Oxford.

He continued to lecture on civil law at Oxford until 1893, when the pressure of public and semi-public duties compelled him to resign. He was elected to the House of Commons in 1880, and served continuously until 1906. In Gladstone's third and fourth ministries, Bryce held several positions, and again in 1905 and 1906 he sat in the Cabinet as Chief Secretary for Ireland. Home Rule had one of its strongest supporters in him.

In recognition of his many services to Great Britain, he was raised to the peerage as Viscount Bryce in 1914. It was his desire thereafter to devote all his time to literary pursuits, but

he was not destined to remain his own master. Soon after the outbreak of the World War, he accepted the chairmanship of a committee to investigate alleged atrocities of the Germans in their invasion of Belgium.

His Literary Career. He had already won distinction in 1862 by the publication of a history, *The Holy Roman Empire*; this study, written when he was only twenty-four years old, is as authoritative in its field as *The American Commonwealth*. His later books include *Impressions of South Africa*; *Studies in History and Jurisprudence*; *Studies in Contemporary Biography*, and *South America*. The latter is a critical analysis of conditions in Brazil, Argentina, and other countries in the southern hemisphere. In 1921 he published *Modern Democracies*.

BRYCE CANYON. See MONUMENTS, NATIONAL.

BRYN MAWR, brin mar, COLLEGE, one of the few distinguished institutions for the higher education of women in America, is located at Bryn Mawr, Pa., a few miles from Philadelphia. It was founded in 1880 by Joseph W. Taylor, a member of the Society of Friends, or Quakers. The college is characterized by its high requirements for admission. The buildings are of gray stone, in Gothic style. The aim of Bryn Mawr is to make the collegiate education of women very much like that of men in the best men's colleges. The students are encouraged to be independent, and to prepare themselves for professional, literary, or public careers.

BRYOPHYTES, bri' o fites. The plants which do not produce flowers are divided into four great groups, or classes, and one of these is the *bryophytes*. The word means *mosslike plants*, and the bryophytes include the *mosses* and the related *liverworts*. Some of these plants have leaves, while others are leafless, but none

of them has true roots. They reproduce by means of spores (which see). Perhaps the most outstanding fact in connection with the bryophytes is what is known as *alternation of generations*; that is, the plants have different phases which do not resemble each other any more than do the caterpillar and the butterfly which develops from it. See LIVERWORTS; MOSSES.

B.M.D.

BUBONIC PLAGUE, bu bon' ik playg. See PLAGUE.

BUCCANEER, buk a neer'. This name applies to the adventurers of the sixteenth and seventeenth centuries who preyed upon vessels in the Caribbean Sea and on neighboring coasts. It originated from the French *boucan*, meaning *place for curing meat*, because the earliest of these adventurers stole cattle, smoked the meat, and sold it to passing vessels. In time, they captured vessels and went to sea.

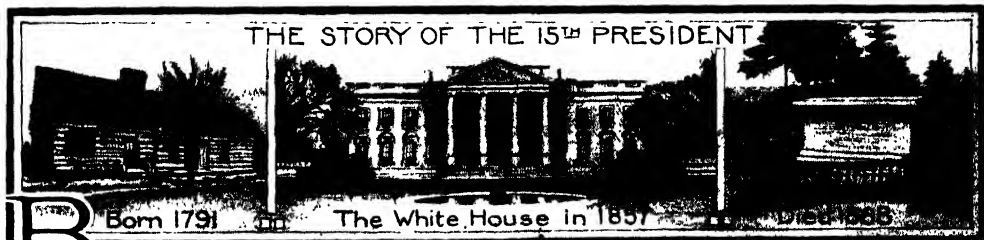
Religious wars between Britain and Spain produced the daring buccaneers Drake and Hawkins; and Sir Henry Morgan, the Welshman, is among the most famous leaders of early buccaneers. In the eighteenth century, the government no longer assisting in or consenting to such robbery, the methods of pirates were adopted. Among pirates, perhaps the most famous is Captain Kidd, whose treasure-trove makes part of the story of Edgar Allen Poe's *Gold Bug*. Later, *marooning* was practiced; that is, putting ashore on desert islands those whom the pirates robbed. For a hundred years, buccaneering has existed only in fiction.

Related Subjects. The reader is referred in these volumes to the following articles

Drake, Sir Francis
Hawkins, Sir John

Morgan, Sir Henry
Pirates and Piracy

BUCEPHALUS, bu sef' a lus. See ALEXANDER THE GREAT.



BUCHANAN, bukan' an, JAMES (1791-1868), the fifteenth President of the United States, whose four years in the Presidential office, unfortunately for him, covered the most critical period preceding the War of Secession. At the time of his inauguration, he was in his sixty-sixth year; with the exception of William Henry Harrison, he was the oldest man ever chosen to that office.

Unlike Franklin Pierce, his predecessor, and Abraham Lincoln, his successor, Buchanan

entered office after he had passed the prime of life. He had long been known as a statesman of ability and experience. He had won honor in both houses of Congress; he had served in President Polk's Cabinet as Secretary of State, and he had been his country's diplomatic representative at the courts of Great Britain and Russia. He was without question one of the leaders, not merely of the Democratic party, but of the nation. His reward was the highest office in the gift of the people,

yet he retired to private life under a cloud of dislike and indignation.

His Youth. James Buchanan was born near Mercersburg, Pa., on April 23, 1791. His parents were Scotch-Irish Presbyterians, who worked hard for a living on their farm. The son was sent to Dickinson College at Carlisle, Pa., where he was graduated in 1809. He then



JAMES BUCHANAN

His reason for accepting the Presidential nomination he stated thus.

They tell me that the use of my name will still the agitated waters, restore public harmony by banishing sectionalism, and remove all apprehension of disunion. For these objects I would not only surrender my own ease and comfort, but cheerfully lay down my life.

studied in a law office for several years, and in 1812 began to practice his profession. In politics, he was at first a Federalist. He was opposed to the second war with Great Britain, but when it came, he said that it was "the duty of every patriot to defend the country," and in 1814 he volunteered as a private for the defense of Baltimore. Buchanan was already known locally as an orator, and in the autumn of the above year was chosen to the legislature, where he served two terms.

Political Career. It was then his intention to remain in private life, but the sudden death of his fiancée altered his resolve, and he became active politically. He was first elected to the national House of Representatives in 1820, and served from 1821 to 1831 without a break. President Jackson then appointed him minister to Russia, where he negotiated the first commercial treaty between the United States and that country. This treaty of 1832 remained in

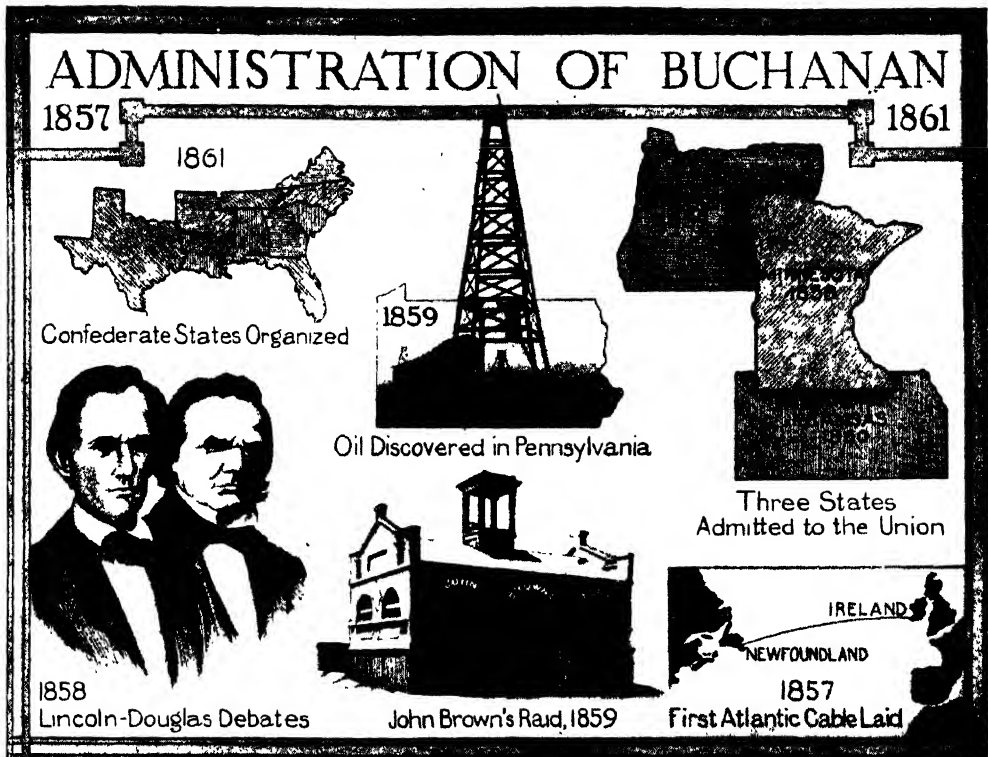
force for eighty years, for it was not abrogated until President Taft's administration.

On his return to the United States, Buchanan lived quietly for a year, but in 1834 he was elected to fill a vacancy in the United States Senate. The Pennsylvania legislature twice reelected him, but he resigned before the end of his third term, to become Secretary of State under Polk. In the Senate, as previously in the House, Buchanan was a leading supporter of Jackson, especially on the issue of the President's right to remove executive officers without explaining his reasons to the Senate. During the many discussions over the right of petition, Buchanan held, with John Quincy Adams, that any citizen possessed this privilege; but on the slavery question, to which most of the petitions referred, he maintained that Congress had no control over slavery in the states.

In 1844 he was Pennsylvania's "favorite son" for the Presidential nomination, but he withdrew his name in favor of James K. Polk. The latter was elected, and he appointed Buchanan as Secretary of State. In this office, he conducted the negotiations concerning the Oregon country, and the friendly settlement was largely due to his efforts. Buchanan was heartily in favor of the annexation of Texas, and during the war with Mexico succeeded in keeping the United States out of disputes with other countries. It was on Buchanan's advice that Polk, in his first message to Congress, reaffirmed the Monroe Doctrine in a declaration aimed at British schemes of colonization in California.

At the end of Polk's term in 1849, Buchanan was succeeded as Secretary of State by John M. Clayton, who negotiated the Clayton-Bulwer Treaty. This treaty marked important departures from the policy of Polk and Buchanan, who had been uneasy over British attempts to establish a protectorate over part of Central America. As the interpretation of the treaty became almost immediately a cause of controversy, President Pierce in 1853 sent Buchanan to London, where he remained as United States minister for three years; most of his time there was spent in an attempt to find a basis for the settlement of Central American problems.

One of the incidents of Buchanan's mission was his work in connection with the Ostend Manifesto of 1854, which won the unqualified approval of many Southerners, but classed Buchanan with the pro-slavery men. He was fortunate in being at a distance while the struggle over the Kansas-Nebraska Act was taking place, for he was free from the bitterness which descended on some of the leaders of the Democratic party. He was therefore nominated for President by the Democrats in 1856, with John C. Breckinridge of Ken-



tucky for Vice-President. "Buck and Breck," as they were called, were elected by a large electoral majority—174 votes to 114 for Fremont, the Republican candidate, and eight for Fillmore. The popular vote was much closer. Buchanan, like Lincoln, Wilson, and some others, was a minority President; he lacked about 372,000 votes of an absolute majority.

Buchanan's Administration. Buchanan's experience as Secretary of State and as diplomatic representative aided him in establishing more friendly relations with Great Britain. The Central American controversy, which he failed to settle while he was minister at London, was finally disposed of by treaties between Great Britain, Nicaragua, and Honduras, largely through his intervention.

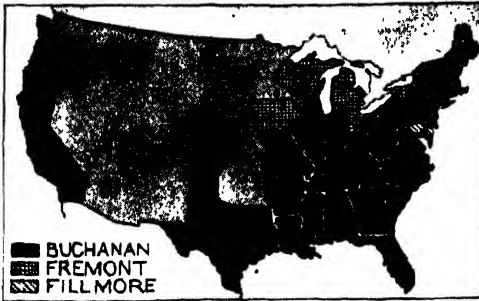
In his American policy, Buchanan worked diligently for the annexation of Cuba, parts of Central America, and possibly Mexico, and even went to the point of urging Congress to give him authority to send troops into Mexico in order to dispose of one of the rival factions there. He encouraged William Walker, the filibuster who for a time was dictator of Nicaragua. The Republicans insisted that his purpose was to bring more slave-holding territory into the Union. The Senate, although Democratic, refused to sanction any of these schemes.

In his domestic policy, Buchanan was equally unfortunate. He foresaw the danger of disunion, but he took no steps to prevent it, and even gave a sort of passive encouragement to those who urged a separation. He was by nature a compromiser. Two days after his inauguration, the Supreme Court of the United States announced its decision in the Dred Scott case; the Court held that Congress had no right to interfere with slavery in the territories.

Meanwhile, the struggle in Kansas went on with increasing bitterness. At first, Buchanan had agreed to the principle of popular sovereignty, but under the influence of the Southerners in his Cabinet, he seems to have been led to the conclusion that the only way to prevent secession of the Southern states was to secure the adoption of the Lecompton Constitution. Although it was once rejected by the people of Kansas, the President gave it his support, declared that Kansas was "already a slave state, as much as Georgia or South Carolina," and urged Congress to admit it. Largely through the influence of Stephen A. Douglas, Congress refused to consider the Lecompton Constitution, and sent it back to the people of Kansas, where it was decisively defeated for the second time. In 1859 occurred John Brown's raid at Harper's Ferry. In spite of this evidence of violent hostility

to slavery, Buchanan did nothing to quell the rising storm. He was still much influenced in his attitude by the Southern members of the Cabinet, particularly Howell Cobb of Georgia and John B. Floyd of Virginia.

Buchanan was by this time identified in the popular mind with the extreme pro-slavery Democrats, yet the fact that he was not considered for renomination either by the Northern or Southern Democrats is some evidence that he was still trying to steer a middle course. Vice-President Breckinridge was nominated for President by the extreme pro-slavery



ELECTION RESULT IN 1856

Democrats, and Douglas was the choice of moderate Democrats. The Constitutional Union party nominated John Bell, and the Republicans named Abraham Lincoln. Although the Republicans disclaimed any intention of interfering with slavery in the states, the election of Lincoln was followed by the secession of the Southern states, led by South Carolina. In February, 1861, the seceded states formed a new government, which they called the Confederate States of America.

During this period, between Lincoln's election in November, 1860, and his inauguration in March, 1861, a heavy responsibility rested on Buchanan. In his annual message to Congress in December, 1860, he argued that there was no right of secession, but on the other hand, he could see no way of preventing secession, because any interference would involve war upon a state. He declared that the North was responsible for the break in the Union, because it would not cease its criticism of slavery.

The whole issue came to a head when, on December 26, Major Anderson removed his little garrison to Fort Sumter from Fort Moultrie, which was almost defenseless against new batteries constructed by the South Carolina government. When South Carolina's commissioners came to him to offer "peace and amity between that commonwealth and the government at Washington," Buchanan refused to see them, except as "private gentlemen of the highest character." Yet he was inclined to

yield to South Carolina's demand that he withdraw the garrison from Fort Sumter. Lewis Cass, Secretary of State, resigned because he thought that the President was not properly defending his country, and Floyd, Secretary of War, resigned after being discredited in a money scandal. Jeremiah S. Black and Edwin M. Stanton, who had succeeded Cass and Floyd, respectively, threatened to resign if the President surrendered Fort Sumter. Under their influence and that of John A. Dix of New York and Horatio King of Maine, two staunch Unionists who came into the Cabinet when Howell Cobb and Jacob Thompson resigned to join their states in secession, Buchanan was persuaded to take a firmer stand, and even consented to the attempt to relieve Fort Sumter by the steamer *Star of the West*.

Buchanan did not want war, but after its beginning he wrote to John A. Dix that Lincoln "had no alternative but to accept the war initiated by South Carolina or the Southern Confederacy." When his term ended, he was within a few weeks of being seventy years old, and it was with great relief that he retired to Wheatlands, his little estate a mile from Lancaster, Pa. There he died, on June 1, 1868, and was buried in the local cemetery.

Summary of His Career. Under normal conditions, Buchanan might have been a President of distinction. But in 1860 he allied himself with the extremists of his party, and when the crisis came, he failed to show self-confidence and energy. The mistakes and weakness of his last year in office have overshadowed his earlier achievements. The President tried to reflect the divided sentiment of the country. On one side, he believed that a state had no right to secede; on the other, he said that the United States had no right to force a state to remain in the Union. His moral scruples prevented him from taking any decisive steps, and brought on him general disapproval. The most bitter of his Southern critics charged him with treachery, and some of his Northern opponents accused him of treason. Like most men who seek to compromise, he was disliked by extremists on both sides. A.B.H.

Other Items of Interest. Every slave-holding state except Maryland gave Buchanan its electoral vote in 1856.

When, on the eve of his return from Russia to the United States, Buchanan paid his farewell visit to the imperial palace, the emperor asked him to request the President to "send another minister exactly like himself."

After his retirement from office, he published *Mr. Buchanan's Administration on the Eve of the Rebellion* a defense of his policies.

Buchanan never married, but he was not a lonely man, for he took into his household a niece and a nephew, to whom he was devoted. When his niece was absent from him, he wrote to her nearly every day.

OUTLINE AND QUESTIONS ON JAMES BUCHANAN

Outline

I. Early Years

- (1) Birth and education
- (2) Law study
- (3) In the War of 1812

II. Political Career

- (1) In the House of Representatives
- (2) As minister to Russia
- (3) In the Senate
- (4) As Secretary of State
 - (a) The Oregon dispute
- (5) As minister to Great Britain

III. Administration

- (1) The slavery issue
 - (a) Dred Scott decision
 - 1 The questions at issue
 - 2 The decision
 - 3 The result
 - (b) The struggle for Kansas
 - 1 "Bleeding Kansas"
 - 2 Attempts to secure statehood

- 3. Lecompton Constitution
 - (c) The underground railway
 - (d) John Brown's raid
- (2) The election of 1860
 - (a) Democratic convention
 - (b) Republican convention
 - (c) Result
- (3) Secession
 - (a) South Carolina secedes
 - (b) Efforts at compromise
 - 1 Crittenden Compromise
 - 2 Peace conference
 - 3 Buchanan's attitude.
 - (c) Formation of the Confederacy
- (4) Other events
 - (a) Admission of states to the Union
 - (b) Financial panic of 1857
 - (c) Atlantic cable, 1857
 - (d) Lincoln-Douglas debates, 1858
 - (e) Oil discovered in Pennsylvania, 1859
 - (f) William Walker's filibustering expedition
 - (g) Death of Washington Irving

Questions

When and why was "Buck and Breck" a popular slogan?

In what sense was North America nearer to Europe at the close of Buchanan's administration than at the beginning?

What stand did Buchanan take on the question of the right of a citizen to petition Congress?

In what way was the President connected with the history of certain Central American states?

When did he refuse to recognize a formal delegation save as "private gentlemen of the highest character"?

How many Presidents were older than Buchanan at the time of their nomination?

How many Presidents were never married?

If he had had his way, how much larger would the United States be than it is at present?

What was his attitude at the close of his term of office on the subject of the coming war?

Why did not Buchanan care to be sent as minister to Great Britain? What led him to accept the post?

What decision, epoch-making in its effects, was pronounced by the Supreme Court during his term of office?

In what way did the death of a girl once affect the history of the United States?

What was Buchanan's attitude toward secession?

Who was mistress of the White House during the administration of Buchanan?

What member of the English royal family was a guest of the President?

What evidence is presented that Buchanan was a friend of the poor?

A man of very simple tastes, the formalities and etiquette of official life were very disagreeable to him, and only his sense of duty to his country caused him to accept his appointment to Saint Petersburg and later to London.

Authorities hold that of all the American Presidents, only Jefferson and John Quincy Adams have equaled Buchanan in the administration of foreign affairs.

It was during this administration that the first Atlantic cable, from Newfoundland to Ireland, was laid.

Washington Irving, called in his own day the "Prince of American Letters," died during this administration.

It was during Buchanan's term of office that the Lincoln-Douglas debates, among the most famous in the history of the country, took place.

When Buchanan was nominated for the Presidency, a paper in his home town which was opposed to him politically and could not therefore be accused of partiality wrote as follows:

"We know him as a friend of the poor—as a perpetual benefactor of the poor widows of this city, who, when the piercing blasts of each successive winter brought shrieks of cold, and hunger, and want, in the trail tenements of Poverty, could apply to the Buchanan Relief Donation for their annual supply of wood."

Mr Buchanan was "a large, muscular man, who enjoyed the most perfect health," and at the age of sixty-five was "capable of enduring as much labor as a young man."

Minnesota, Oregon, and Kansas were admitted to the Union during this administration. The dates of admission were 1858, 1859 and 1861.

Mistress of the White House. Few hostesses at the Executive Mansion have had such a triumphal reign as Miss Harriet Lane, the much-beloved niece of the only President who never married. She was the daughter of his favorite sister, Jane Buchanan Lane. When her parents died, in her childhood she chose the home and guardianship of her Uncle James.

She accompanied her uncle to London when he became American minister to Great Britain, and the prestige of her distinguished relative and her own popularity with the queen gave her the official rank of a minister's wife; her charm and her blonde, violet-eyed beauty made her a favorite of the diplomatic corps. When she returned to become mistress of the White House, upon the election of Buchanan to the Presidency, she maintained a brilliant social life, entertaining not only American visitors but many distinguished friends who had known the President in his long service abroad. Among the latter was the Prince of Wales (later King Edward VII), on the first royal visit to America. The secession movement placed Buchanan in many trying situations, which Miss Lane's grace and tact helped to make less serious.



Photo U & U

HARRIET LANE

At her uncle's Pennsylvania home, Wheatland, she was married to Henry Elliott Johnston, in 1866. Their one son died in 1881.

Related Subjects. The reader who desires added information on the life and times of this President is referred in these volumes to the following articles:

Brown, John	Lincoln, Abraham
Confederate States	Mexican War
Dred Scott Decision	Ostend Manifesto
Fort Sumter	Walker, William
Kansas (History)	War of Secession

BUCHAREST, OR BUKHAREST, *boo ka-rest'*, the capital of Rumania, a picturesque city on both banks of the River Dimbovitza, about thirty-three miles north of the Danube. The city is ordinarily one of the gayest of European capitals, and has acquired the popular name of "Little Paris." It is famous alike for its bohemian atmosphere and for its fashion.

Although there are still portions which retain their Oriental appearance, with narrow, crooked, and somewhat dirty streets, the city is for the most part modern and well planned. Fine bridges across the river connect the two portions of the city. There are many beautiful buildings, and the city is noted for its great churches. The manufactures are not highly developed, and before Rumania entered the World War in 1916, the industries were chiefly in the hands of Germans. Bucharest is an important center of trade in petroleum, cereals, timber, hides, honey, and wax. The population is composed of many nationalities, including Greeks, Turks, Jews, Russians, Poles, Germans, and Hungarians. The city was made the capital of Rumania in 1862, when that kingdom was created by the union of Wallachia and Moldavia.

Bucharest has been visited by plague several times, and in 1813 this dreadful scourge claimed 70,000 victims in six weeks. In December, 1916, after a campaign of but a few weeks, the Austro-German forces captured the city and 15,000 square miles of Rumanian territory. Although the German occupation of the city left it in a sorry condition, it has developed considerably since 1918. In 1925 a plan to provide for the city's external obligations was made. Population, 875,000. See RUMANIA.

BUCK, the mature male goat (which see).

BUCK, DUDLEY (1839-1909), a distinguished organist and composer, who held first rank among modern American composers of church music. He was born at Hartford, Conn., began his musical studies at the age of sixteen, and was an organist in his home city until 1858. Thereafter, he studied in Europe for five years, and on his return to America, began a long and honored public career. He held important organ positions in Chicago, New York, and Boston, engaged in concert tours, assisted Theodore Thomas in conducting his orchestra concerts, and for several years was organist and conductor for the Brooklyn Apollo Club.

By his church music, especially, he helped to elevate musical taste in his own country.

Principal Compositions. Buck's best-known compositions include numerous songs, hymns, anthems, and other church music; the music for Sidney Lanier's cantata sung at the opening of the Philadelphia Centennial in 1876; the cantata based on Longfellow's *Golden Legend*, which won a thousand-dollar prize offered by the Cincinnati Musical Festival of 1880; the cantatas entitled *King Olaf's Christmas*, *The Light of Asia*, and *The Voyage of Columbus*; the overture to *Marmion*; two operas; and the organ sonatas in E flat and G minor

BUCKETSHOP, an establishment which appears to transact a regular, legitimate business in buying and selling grain or securities, in the same manner as transactions on the board of trade; but it is in reality merely gambling with its customers. A customer, for example, buys 100 shares of stock on "margin." The bucketshop broker, instead of buying the stock, merely makes the necessary entry in his books. If the stock rises in price, the customer gets his margin back and the extra profit; if it falls, the broker keeps the margin.

The margins required are usually small, sometimes as low as one per cent, and a slight fluctuation downward in price of stock is enough to put a margin in the pockets of the bucketshop operator, because if a margin does not cover the change in price, the purchaser loses his investment. Bucketshops are nothing more nor less than gambling houses, and laws prohibiting them are practically universal. See **BOARD OF TRADE**; **STOCK EXCHANGE**. F.H.E.

BUCKEYE, the name applied to American species of the horse-chestnut genus. See **HORSE CHESTNUT**

BUCKEYE STATE, a popular name applied to Ohio (which see).

BUCKINGHAM, GEORGE VILLIERS, Duke of (1502-1628), an English nobleman, known as the "power behind the throne" during the reigns of James I and Charles I. In 1623, when a marriage was being arranged between Prince Charles and the Infanta of Spain, Buckingham went with the prince to Madrid to carry on the suit in person. The result, however, was the breaking off of the marriage and a declaration of war with Spain. After the death of James, Buckingham was sent to France, as proxy for Charles I, to marry Henrietta Maria.

In 1626, after the failure of an expedition against Cadiz, he was impeached, but was saved from death by the favor of the king. Despite the difficulty in obtaining supplies, Buckingham took upon himself the conduct of a war with France, but the attempt proved a failure. His incapacity, no less than the injustice of his having received such high honors, titles, and preferments at the hands of the king,

made him extremely unpopular, and a second impeachment was prevented only by the dissolution of Parliament. He then set out on another expedition to Rochelle, but was assassinated while embarking. It has been declared that few men more unworthy have found a high place in English history. It was entirely to his handsome and graceful person and to his manners, affable enough to those who might benefit him, that he owed the royal favor. See **ENGLAND (History)**.



Photo. Brown Bros.
DUKE OF BUCKINGHAM

BUCKINGHAM
FOUNTAIN, the largest illuminated fountain in the world. See **CHICAGO (The Business Section)**; **GEORGIA (Mining)**.

BUCKLE, HENRY THOMAS (1821-1862), an English historical writer who will always be remembered for his *History of Civilization in England*. When he was twenty years old, he was reputed to be one of the greatest chess players in the world, but he gave up this game, of which he was very fond, to devote his time to the writing of history. Though for seventeen years, from 1844 until the year before his death, he labored ten hours a day on the work named above, he completed only two volumes of it.

These volumes are themselves merely an introduction to the work he planned. The first states the general principles of his method and the laws by which human progress is governed, the second illustrates these laws and principles by references to the histories of Spain, Scotland, Germany, and the United States. Buckle's arguments are frequently open to criticism, but his work has been of value in stimulating historical research and discussion.

BUCKLER. See **SHIELD**
BUCKNELL COLLEGE. See **PENNSYLVANIA (Education)**.

BUCKSKIN, a soft, yellowish, or grayish leather, in pioneer days used by Indians and frontiersmen for clothing. It is now employed mostly in the manufacture of gloves. In the early days, it was made of the skin of deer, from which fact its name was derived, but it is now usually made from sheepskin, with no change in name. To obtain the softness which is the chief quality of buckskin, oil is used in the dressing. A kind of twilled woolen cloth, now largely used for riding breeches, is also called buckskin. See **DEER**.

BUCKTAILS. This name was applied in the United States from about 1816 to 1830 to a faction of the Democratic-Republican party, identified with Tammany and opposed to the administration of Governor Clinton in New York. The Bucktails gained the ascendancy in the party in 1822, but lost it in 1824. From the circumstance that each member wore in his hat a buck's tail, the insignia of Tammany, the name was derived. See **POLITICAL PARTIES; DEMOCRATIC-REPUBLICAN PARTY; TAMMANY.**

BUCKTHORN, a spiny shrub often cultivated as a hedge plant. It was introduced into North America from Europe, and in some sections has become naturalized. The buckthorn grows to a height of seven or eight feet. Its leaves are oval, usually rounded at the base. The flowers, which appear in May, are of an inconspicuous green, pistillate and staminate flowers being produced on different bushes. The fruits, which are about one-quarter of an inch across, berrylike and black, bear four seeds. The juice of the ripe berries, mixed with alum, is used by artists as sap-green. Medicinally, the berries produce a powerful purgative, but one that is not often used. The bark yields a beautiful yellow dye. The drug cascara (which see) is obtained from the bark of a related species

B.M.D.

Scientific Name. The buckthorn belongs to the buckthorn family, *Rhamnaceae*. Its botanical name is *Rhamnus cathartica*.

BUCKWHEAT, a plant producing a three-sided seed, or grain, at present considered of secondary importance but well worthy of cultivation. The origin of buckwheat is not known, but it is supposed to be a native of Asia, and was therefore named *Saracen wheat* by the French. It takes its present name from a German word meaning *beech wheat*, because of the resemblance of the seeds to the beechnut.

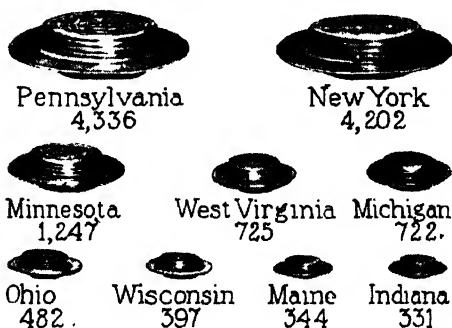
The plant has smooth, branching stems, green leaves with dark veins, and white flowers. Rather light, well-drained soils are best suited to buckwheat, but the crop is hardy and is less affected by soil than by frost. Because it grows well on poor soil, with little cultivation, it was in an early day called the poor farmer's crop, and so the term *buckwheaters* was once applied in some localities to the unskilled farmers.



BUCKWHEAT
Top of stalk, flower, and fruit.

For the best results, plant buckwheat as late as possible to secure a sufficient crop before the severe frosts. It usually matures in ten or twelve weeks from the time of seeding. It begins to bloom early, and continues to blossom until harvest, so at that time all of

THOUSANDS OF BUSHELS



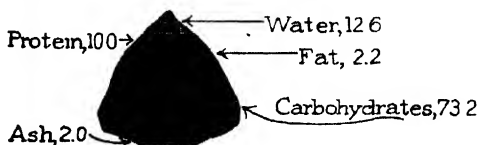
PRODUCTION CHART

Comparative crop in leading states illustrated by plates of that favorite breakfast food, buckwheat cakes.

the grain is not fully matured; but the farmer soon learns to judge the best time for harvest.

Buckwheat is a useful plant in another sense, for by its shade it stifles many weeds, and leaves a clean field for the following year; it is an excellent soil-renovator and a green-manure crop.

While cultivated in China and other Eastern countries as a food plant, in Europe buckwheat is used principally as feed for stock and poultry, being excellent for pheasants. It is sometimes given to horses, with bran, chaff, or grain. In the United States and Canada.



COMPOSITION OF BUCKWHEAT

it is extensively used to make flour from which breakfast cakes are prepared. Beer may be brewed from it, and it has been used in preparing cordials. The blossoms have been used for brown dye. Buckwheat is sometimes grown by bee farmers, for the blossoms are a favorite forage for bees; buckwheat honey is dark, and has a characteristic flavor.

Buckwheat is quite extensively grown in the United States east of the Mississippi River and from Pennsylvania northward, averaging about 13,000,000 bushels a year. The legal weight of buckwheat is from forty-eight to

fifty-two pounds per bushel in the various states. T.L.L.

Scientific Names. Buckwheat, although included among the grains, belongs to the family of plants known as *Polygonaceae*. The varieties grown in the United States are of the species *Fagopyrum esculentum*.

BUCOLICS, *bu kahl' iks*. See VERGIL.

BUCYRUS, *bu si'rus*, O. See OHIO (back of map).

BUD, as the term is most commonly used, means an unopened flower, but it applies just as truly to an undeveloped leafy shoot.

Leaf Buds suggest an adjustment to changing conditions, allowing leaves to exist safely through a winter, and they furnish one of the most remarkable instances of the way by which plant parts are related to their environment. At the apex of the stem and arising from the stem in the axil of the leaf, normally, buds occur. Those that pass through hard winters are often constituted, in part, of tough scales, oftentimes as shiny as though varnished. Within may be a woolly coat, undoubtedly serviceable in preventing loss of moisture after freezing; thus, indirectly, it may protect the sensitive young leaves during winter.



FAMILIAR BUDS

Apple
Red Haw

Pear
Peony

However tiny, one or more leaves in this bud are in form the fully developed leaf, but they are folded and packed away so closely that not the slightest space goes to waste. For any plant species, the leaves are always folded or rolled in the same way.

Everyone has doubtless watched the leaves of a fern unroll from the tip, but it is not so easy to see just how all leaf buds develop. The sorrel, or sour grass, has its three leaflets, each folded smoothly in the middle, pressed

closely together; the magnolia leaf is folded along its central vein, with the dull inner surface outward; the currant leaf is plaited like a fan; the violet leaf has its two margins rolled



A GROUP OF BUDS

- | | |
|----------------------|-----------------|
| (a) Wild rose | (f) Iris |
| (b) Shagbark hickory | (g) Meadow lily |
| (c) Lilac | (h) Cottonwood |
| (d) Cherry | (i) Water lily |
| (e) Horse-chestnut | |

inward toward the center. Careful watching in the spring, when green things are just beginning to appear, will reveal many more interesting methods of close packing.

Flower Buds, too, may possess coverings, especially the early flowering trees and shrubs, but such coverings are rarely as thick and strong as are those of some leaf buds. Often the green outer part of the flower, the calyx, is folded about the colored corolla, and the beautiful tints do not begin to appear until the bud opens. It is easy to watch flower buds in the process of unfolding; everybody has seen the quickly expanding morning-glory, for instance, unfold from a tight bud, furled like a rolled umbrella, into a glowing bell; or a rose loosen deliberately its overlapping petals. Violets, daffodils, hollyhocks, lilies—all have their own individual methods of opening, and all of these are well worth observing. In recent years, moving pictures have been taken of many flower buds expanding into flowers. When shown on the screen, the process is quickened, a series being shown in two or three minutes which it took the camera days to obtain, in exposures at regular intervals from minutes to hours, depending upon the rate of unfolding. For illustration, see article MOVING PICTURE. B.M.D.

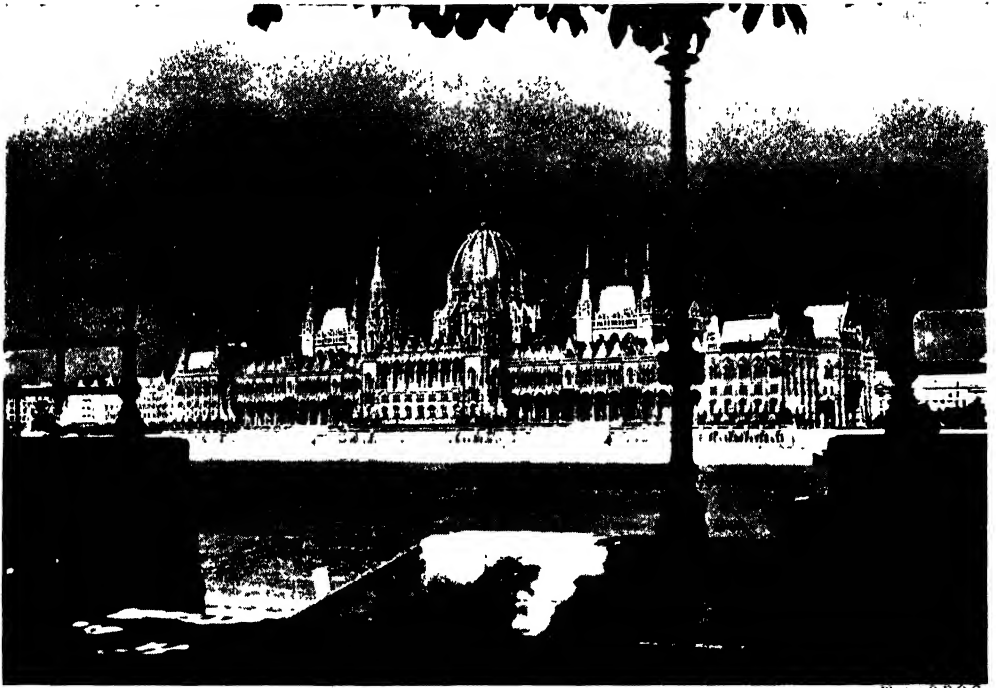


Photo: O R O C

PARLIAMENT HOUSE AT BUDAPEST

Like a marble mirage rising fairylike from the river is this building of Hungary's lawmakers. It covers nearly four acres, and was completed in 1896. When bright sunshine pours upon this structure it has the appearance of a gigantic picture out of fairy-land

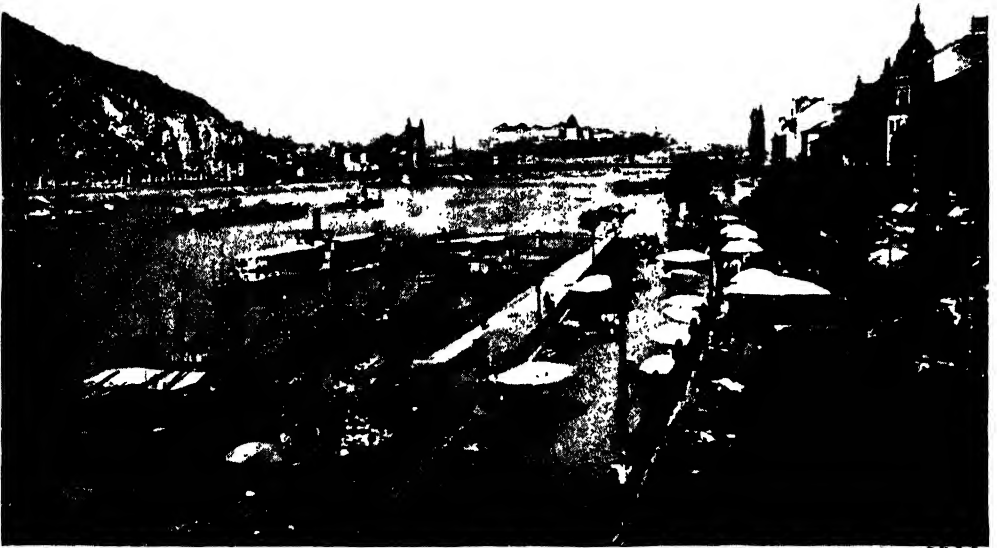


Photo: O R O C

LOOKING DOWN THE DANUBE

On the right side of the river is Buda, and on the left is Pest. In the background is Queen Elizabeth Bridge, and deep in the upper center is the royal palace, now without a kingly occupant. (See illustration of palace in article HUNGARY.)

BUDAPEST, *boo dah pest'*, a city on both banks of the Danube, and the capital of the new state of Hungary, is composed of two towns, Buda and Pest, which were united as one municipality in 1872. The two portions of the town are joined by bridges across the Danube, one of them a suspension bridge 1,230 feet in length. It is admirably situated to be the central point from which all Hungarian railways radiate, and therefore it receives nearly all the products of the surrounding territory. The commerce is very extensive; grain, wines, tobacco, hides, hemp, cattle, sheep, and pigs are exported.

There are numerous mineral springs in the vicinity, and the waters, especially that known as Hunyadi Janos, have achieved a wide reputation for medicinal properties. Among these springs is one of the deepest artesian wells in the world, descending over 3,000 feet. Budapest is best known commercially, however, as a city of model flour mills; it is one of the greatest milling centers of the world. Grain is brought to its elevators by rail and by huge river barges. The Danube River is an even more important highway of commerce than the railways.

Pest, although more modern than Buda, has far outgrown the latter city in importance, both commercially and as a seat of learning and culture. One of its streets, the Andrassy Strasse (Street), lined by fine buildings, is among the most beautiful in Europe. Even late in the last century, the towns now united as Budapest were backward in all matters relative to public health; but the Budapest of to-day is well drained, has practical sewerage systems and filtration plants, and possesses all municipally owned public utilities demanded by a progressive city. It was the first city in the world to establish an underground electric trolley system.

The growth of the combined cities has been remarkable. In 1841 the population was 107,240, but by 1927 this had increased to 971,169, excluding suburbs.

Derivation. The town *Buda* was named after Buda, brother of Attila the Hun. *Pest* is derived from a Russian word meaning *oven*; the name was given to the town probably on account of its great lime kilns.

BUDDHISM, *bood' iz'm*, the religious system founded in the sixth century B.C. by the Hindu sage, Buddha, "the Enlightened," who, in his life and teachings, was more like Christ than any other of the great teachers of mankind. When the founder of Buddhism began to teach, the prevailing religion in India was that taught by the Brahmans. Buddha, like the Brahmans, believed that existence was a sorrow and an evil, but he taught the people that salvation should be sought through a change of heart, not by sacrifices, ceremonies,

and self-torture. Buddha declared that his followers were released from the restraints of caste, and the poorest outcast was encouraged to seek the benefits of his teachings. The new faith thus represented a revolt against the



Photo ORIX

THE GREAT BUDDHA

As immutable as time itself, apparently, is the Diabutsu (Great Buddha). It has stood since the year 1252, while earthquakes have repeatedly destroyed temples in which it has been housed. The statue stands in Kamakura, Japan.

teachings of the Brahmans, and in its spirit Buddhism bore somewhat the same relation to Brahmanism as Christianity did to Judaism in the days of the early Church.

The central idea in Buddhism is that *Nirvana*, or release from existence, is the chief good, and that Nirvana can be attained only by crushing all desire. The Buddhist who follows the "path to the other shore" must hold fast to eight conditions: right view, right judgment, right language, right purpose, right profession, right application, right memory, and right meditation. The five great commandments of Buddhism forbid killing, stealing, the committing of adultery, lying, and drunkenness. Almsgiving, purity, patience, courage, contemplation, and knowledge are the virtues especially cultivated.

When all the conditions have been met, the individual may hope to have his reward in ceasing to exist. But the path to Nirvana is too difficult to travel over in one lifetime, so when the body dies the soul must find another abode. This doctrine, the transmigration of the soul, is found in both of India's religions, and is an important tenet.

To Asoka (died 228 B.C.), a great ruler of India, is given the credit of transferring the state religion from Brahmanism to Buddhism.

It has been said of the moral code of Buddhism that for pureness, excellence, and wisdom, it is second only to Christianity, but Buddhism and Christianity are far apart in the great end which the followers of these religions seek. For the Christian, the end of striving is eternal life, and the thought of ceasing to exist is repugnant.

Buddha taught that there were no gods, and that priests, ceremonies, prayers, and sacraments are unnecessary. His teachings, however,



THE GREATEST BUDDHIST TEMPLE

The great Temple of Maha Bodhi, at Buddha Gaya, 100 miles from Benares, is Buddhism's most sacred shrine. The tree in the right foreground is the sacred bo-tree, lineal descendant of the bo-tree under which Buddha sat when the principles of his faith were unfolding.

have been greatly changed during the passing centuries, and modern Buddhists rear temples, offer prayers, and hold formal religious services. Though Buddha is not worshiped as a god, the adoration of his statues and of his relics is a very important feature of the worship of his followers. In the modern Buddhist temple, the central object is an image of the great teacher or a shrine containing his relics, and before this, flowers, fruit, and incense are offered each day.

In the Indian peninsula, the birthplace of the Buddhist faith, this religion has now but a feeble hold, but it prevails in Ceylon, Burma, Java, Cochinchina, Laos, Nepal, Tibet (where

it takes the form of Lamaism), Mongolia, China, and Japan, and its followers are estimated to number nearly 150,000,000.

Buddha, *bood' ah*, the sacred name of the great reformer and teacher of early India, who became the founder of the religion known as Buddhism. His name was Siddhartha, and his family name Gautama; *Buddha*, acquired by him as the founder of a great religious system, is the Sanskrit for *the Wise*, or *the Enlightened*.

He was born in the sixth century before Christ, in the town of Kapilavastu, a few days' journey north of Benares. Tradition says that he was a prince of royal blood. Of his youth, little is known except what has come down in legendary form; the many tales that sprang up about his early life and achievements have been picturesquely woven together by Sir Edwin Arnold in his romantic poem, *The Light of Asia*.

It is told that he married, and that in his thirtieth year, shortly after the birth of his son, he left his father's court and his wife and child, and wandered forth to seek the path of salvation, as taught by the Brahmins. He then entered upon a period of meditation, fasting, and self-torture, and while seated under the sacred bo-tree, the light of the truth was declared to have dawned upon his troubled spirit. To him it was revealed that the one way to find deliverance from suffering was by crushing all desires of the heart. Commencing at Benares, Buddha began to teach his new faith, in opposition to Brahmanism, and he won thousands of converts by his pure life and gentle and earnest spirit. During his lifetime, he saw his doctrines carried to all parts of India. B.M.W.

Related Subjects. The reader is referred in these volumes to the following articles

Brahmanism	Lamaism
Caste	Religions of the World
Japan (Religion)	Transmigration

BUDDING, in zoölogy. See PROTOZOA.

BUDGET, *buj' et*, "a means of telling your money where to go, instead of wondering where it all went." As usually defined, it is the official summary of finances, including a forecast of the receipts and expenditures of the coming year. But this is a comparatively new meaning. The word was derived from *bougette*, an old French word meaning *bag*, *pouch*, or *wallet*. In England, the name was applied in an early day to a wallet or box in which legal and official documents were carried, and especially to the tiny trunk in which the Chancellor of the Exchequer kept his papers. Therefore, when he appeared in the House of Commons he "opened his budget" to read the statement of the country's financial condition. About 1760, the term was first commonly applied to the financial statement itself.

Great Britain and Canada have long had the budget system. In the United States, until the Harding administration, the country had no budget. Congress made all appropriations, and determined how every dollar should be spent. The executive departments might make suggestions, but they had no voice in decisions. Many efforts had been made to adopt a budget

system, but until 1921 they had been fruitless. In the year named, a budget law was passed, in the hope that the enormous expenses of the government growing out of the war might be curtailed. The President appointed Charles G. Dawes, later Vice-President of the United States, as Director of the Budget, and that official was given extraordinary powers in investigating expenditures and details of government work. He firmly established the nation's budget, and great economies were worked out.

The theory on which a budget is based is that the executive officers of a government are best qualified to determine how much money is needed and how it shall be spent. The people's representatives in the legislative department merely give their consent. The budget appropriates a grand total, and indicates approximately how much each department of the government is to receive, but just how this share shall be disposed of is an executive, not a legislative, function. See HARDING, WARREN GAMALIEL (As President); INCOME DISTRIBUTION.

The Family Budget. A system of finance for the family is urged by all economists. To appropriate certain sums on a monthly basis for food, rent, clothing, education, the church, taxes, amusements, charity, medical attention, savings, etc., and except in extraordinary circumstances to adhere strictly to it, is to operate the home on the budget system. In many families it has marked the beginning of financial independence. E.D.F.

BUDGET, DIRECTOR OF THE. See TREASURY DEPARTMENT; BUDGET.

BUENAVENTURA, *bwa nah ven too' rah*, See COLOMBIA (Transportation and Communication).

BUENA VISTA, *bwa' nah vees' tah*, BATTLE OF. See MEXICAN WAR.

BUENA VISTA LAKE. See CALIFORNIA (Waters).

BUENOS AIRES, *bwa' nohs i' raze*, or *bo'-nus a' riz*, the capital of Argentina, known by reason of its beauty, its fashion, and its cosmopolitan character as the "Paris of America." It enjoys several distinctions, for its population of 2,116,285 in 1930 not only made it the largest city in the world south of the equator but the second largest Latin city in the world, Paris alone surpassing it. Rome, with its thousands of years of history and with the civilization of Europe all about it, is not one-third as large as this comparatively modern city in a continent which until recent times has not been ranked as progressive.

Location and Appearance. Though Buenos Aires is situated 175 miles from the mouth of the Rio de la Plata, it is in effect a seaboard city, for the river at that point is thirty miles wide, and it has been dredged so that large vessels may reach the city.

Outline and Questions on Buenos Aires

I. Location and Size

- (1) Latitude, 34° 36' 21" south
- (2) Longitude, 58° 21' 33" west
- (3) Latitude compared with that of Northern cities
- (4) Area
- (5) Population

II. Description

- (1) Streets
 - (a) How overcrowding is avoided
- (2) Public buildings
 - (a) Government palace
 - (b) Cathedral
 - (c) Churches
- (3) Parks
- (4) The old section
- (5) Schools
- (6) Public hygiene

III. Commerce

- (1) Exports
 - (a) Value
 - (b) Character
- (2) Imports
 - (a) Value
 - (b) Character

IV. The People

- (1) Native Argentinians
- (2) Foreigners
 - (a) Origins
- (3) Character of the people
 - (a) Gay and pleasure-loving

V. History

- (1) Settlement
- (2) Troubled times
- (3) Recent progress

Questions

Why is there little danger of collisions in the narrow crowded streets of the downtown section?

How many cities larger than Buenos Aires are there in which a Romance language is the ordinary language of the people?

How can a city which is 175 miles inland be reckoned a coast city?

What does the name of the city mean? The name of the river on which it is situated?

How many cities in the United States surpass Buenos Aires in population?

How many cities in the western hemisphere have a larger commerce?

What is meant by calling Buenos Aires the "Paris of America"?



Photo OROG

A PARTIAL VIEW OF THE CITY

A good idea of the architecture of this great city of the southern hemisphere may be gained from the illustration.

The name Buenos Aires means *good air*, but the locality is not naturally very healthful, though improved sanitation has done much to lower the death rate. The city lies on a broad, spreading plain only fifteen to twenty-five feet above sea level, in the midst of the great grazing and cereal centers of the country. It

but one direction on many streets. Trees line many of the avenues; there are thousands of handsome homes and magnificent business blocks; attractive parks display the plants and animals of the region. Some of the city's most beautiful buildings, such as the hall of Congress, the municipal building, the palace of justice, the government palace, the Casa Rosada (where the President lives), the cathedral, and the episcopal palace, are grouped about the Plaza de Mayo. Buenos Aires prides itself on having one of the finest and most perfectly equipped newspaper buildings in the world.

While this modern part of the city is the most attractive, the old section is even more interesting. Low, flat-roofed houses, built in Spanish style about open courts and presenting to the street heavily barred windows, are most in evidence.

The People. Like most great cities of America, Buenos Aires has drawn its inhabitants from all over the world, and everywhere may be heard a veritable Babel of tongues. Descendants of the old Spanish settlers make up about half the population, but the other half comprises Italians in large numbers, Spaniards, Frenchmen, Englishmen, Germans, and a few Americans. True to its Latin origin and character, the city is pleasure-loving, and life for the well-to-do has the gayety, the brightness, and the excitement which are usually associated with Paris. It is an extravagant city, so immigrants are encouraged to find their way inward to the rich but sparsely settled agricultural centers.

Progressiveness. The city has excellent communications with other towns, and a



LOCATION MAP

In the small corner map the black space represents that part of Southern South America shown in the larger map.

has all the characteristics—the business section, residence section, factory section, slums, parks, and show places—of a Northern city.

The streets are for the most part broad, though in certain of the busy downtown districts they are too narrow for the throngs that crowd through them, and congestion is avoided by allowing vehicles of all kinds to move in

thoroughly adequate system of street railways and subways within its own boundaries. In its schools and other educational institutions, it is most progressive, and many Northern cities might take lessons from its careful supervision of hygiene. But it is in its commerce that the city shows most clearly its up-to-date character, for it is the second port in America, only New York carrying on a larger foreign trade. Its imports, consisting largely of manufactured goods, amount in normal times to

more than \$1,000,000 daily, and its exports of grain, wool, livestock, and cattle products slightly exceed that sum. Most of the trade has formerly been with Europe, but of late years that with the United States has been increasing steadily.

History. Attempts were made in 1535 and in 1542 to found a Spanish colony on the site of Buenos Aires, but without success; the present city dates from 1580. Its growth, though slow, was steady, and its importance as a port was such as to lead to its choice in 1776 as the capital of the province of Rio de la Plata. Having discovered their strength in 1806 and 1807 by defeating attempts of the English to seize the colony, the people in 1810 declared their independence from Spain. From 1851 to 1859, Buenos Aires, with the province of the same name, was a separate state; the difficulties which had led to its secession were finally adjusted, and in 1880 the city was made the capital of the republic. Since that time its history has been one of steady growth, for it has suffered but little from the revolutions which have prevented progress in most South American states. Indicating the friendly feeling of other nations for Argentina are the recent centenary gifts to Buenos Aires, including a handsome clock tower erected by the British colony, and various statues by the United States, Spanish, French, and other communities.

Buenos Aires is one of the few cities of the world which possess subways for passenger transportation. Since 1920 nearly eighty new parks have been platted for pleasure grounds.

BUFFALO. This name is borne by several species of wild ox, but the best known is the common black water buffalo of India, now found domesticated in nearly all the warmer countries of Asia and Africa. It is the largest of wild cattle; bulls are often from five to six feet in height and have a six-foot spread of

horns. These horns are triangular, and they curve outward and backward to form a circle. The hide of the animal is bluish-black, and is plainly visible through the scanty hair.

The Indian buffalo has long been used in the rice fields of Asia, and is now found in Egypt and several countries of Southern Europe. The hide is tough and thick, and it makes excellent leather. The milk of the cow is nutritious food, and is used in India for making a sort of fluid butter. A smaller



WATER BUFFALO

variety, domesticated in the Philippines, is called *carabao* (which see). The South African, or Cape, buffalo is found throughout the southern part of Africa. It is slightly smaller than the water buffalo of India, and has short horns which unite on the forehead, forming a sort of helmet. The Cape buffalo is one of the fiercest wild animals known, and has never been domesticated. A smaller species, brown in color, is found in the Congo region.

American Buffalo, or Bison. The bison, or American buffalo, is not a true buffalo, from the viewpoint of the zoölogist, because of differences in structure. For instance, the buffalo has thirteen pairs of ribs, and the bison, fourteen; the shoulders, head, and neck of the bison are much heavier and the withers are much lighter, in proportion, than the corresponding parts in the buffalo. Nevertheless, the bison has been called a buffalo for so many years that it is now commonly known by this name.

The American buffalo is of a dark, reddish-brown color, and the head, neck, and shoulders of the male are covered with a thick growth of coarse hair which in some instances is almost black. This hair forms a great beard on the throat and chin. The head is very large, and is carried low. A full-grown bull is about six feet high at the shoulders, and when in good flesh will weigh about 2,000 pounds.

The first knowledge of American bison is in the account of a Spanish exploration of the Southwest early in the sixteenth century. Formerly, these animals were found by the thousands in all that portion of North America between the Appalachians and the Rocky Mountains and from Texas to the Peace River in Canada. The Indians used their flesh for food and their skins for clothing. The value of the skins soon became known to white men, who used them for robes and coats. The slaughter of the buffalo, which began soon after



Photos. U & U. Canadian Pacific Railway

Descendants of Mighty Herds of Former Days. Upper left, a group in Buffalo Park, Banff, Alta ; center, in Yellowstone National Park. Upper right, a magnificent specimen of the male of the species. In the lower picture there is a suggestion of tragedy. A bull stole a baby buffalo from its mother, and would permit no one to come near it for many hours. The incident occurred in Druid Hill Park Zoo, Baltimore

the coming of the whites, continued until these magnificent animals disappeared in the wild state. Moreover, their disappearance from game preserves became a possibility. Concerted efforts in the United States and Canada by lovers of wild life now assure the preservation of the America buffalo. In the two countries, there are to-day about 15,000 head. The herd in Yellowstone National Park numbers over 800, and there are nearly as many in the Montana National Bison Range. The Yellowstone bison were filmed most effectively in a remarkable moving picture in 1925, Zane Grey's *The Thundering Herd*. Where protected, the animals increase in numbers rapidly, and sometimes become so numerous as to tax the facilities of the grazing range. Surplus animals are sent to city parks, smaller game preserves, and private estates, or are killed. The Canadian government herds

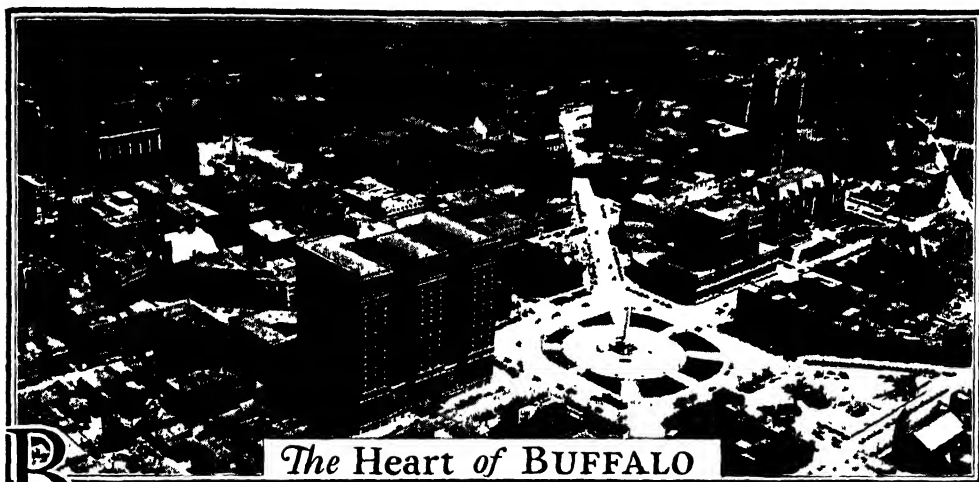
are distributed among Buffalo Park at Wainwright, Elk Island Park, and Buffalo Park at Banff.

The European bison is closely related to the American form. It, too, is nearly extinct, only a few being found in the wild state in the Caucasus, where they are protected by the Russian government.

An attempt has been made to produce a new, useful domestic animal by crossing the bison and the domestic cattle. The product, called the "cattalo," has not, however, proved very satisfactory, and interest in the experiment is lessening.

W.N.H.

Scientific Names. Buffaloes and bison belong to the sub-family *Bovinae* of the family *Bovidae*. The water buffalo of India is *Bubalus bubalis*; the Cape buffalo, *B. caffer*; the Congo species, *Synerus nanus*. The American buffalo is *Bison bison*. The European bison is *Bison bonasus*.



B The Heart of BUFFALO

BUFFALO, N. Y. Located on the opposite border of the state from New York City, and founded over a century later than that metropolis, Buffalo has grown to be the second largest city in the state and the twelfth in population in the United States. It is, moreover, one of the ten busiest commercial ports in the world, and in tonnage it ranks second among all inland ports. Its location is ideal for a city of commercial and industrial outlook. Situated at the eastern end of Lake Erie, it is a natural center for the reception and distribution of commodities shipped by way of the Great Lakes and the Saint Lawrence River. As the western terminus of the Erie Canal, now a part of the greater New York State Barge Canal, it is a port of call for ships plying between the Great Lakes and the Atlantic coast of the United States.

As the center of a vastly extended productive region, it is the natural market for such basic

raw materials as grain, lumber, and iron ore, and for the essential fuels, coal, oil, and gas. It is the largest grain-distributing point of the country, its elevators of forty million bushels capacity handling nearly 300 million bushels of grain yearly. Its location at the head of the Niagara River, only twenty miles south of the Niagara Falls district, gives it access to inexhaustible hydroelectric power for manufacturing, lighting, and transportation.

To these advantages should be added proximity to the population centers of Canada, with their demands for manufactured goods, and a strategic position with respect to the principal railroads of America. Buffalo is also a radial point for the main-traveled motor-highways crossing New York state, the scenic attractions of Niagara Falls bringing countless tourists to the vicinity every year.

Buffalo is the county seat of Erie County. It is the center of the area accepted by the

United States Census Bureau as the Buffalo Niagara Metropolitan District, embracing Erie and Niagara counties and extending northward to Lake Ontario and southward to Cattaraugus Creek.

In 1928 the Niagara Area was created by action of Canadians and the business interests near Buffalo, and a development committee is doing extensive work in planning and developing 1,806 square miles of Niagara frontier up to the Welland Canal.

The city is 430 miles northwest of New York, 297 miles west of Albany, and 523 miles northeast of Chicago. Across the Niagara River and the narrow end of Lake Erie, to the west, lies the province of Ontario. Population, 1930, 573,070.

General Description. From the earliest settlement on the mouth of Buffalo Creek, the city has grown northward, following a gradual slope of land which rises from fifty to eighty feet above the lake and 600 feet above sea level. Buffalo has an area of but forty-two square miles, but is surrounded by a populous district that is practically a continuation of the city proper; within the metropolitan area there are three-quarters of a million people. Along with its business expansion, the city has developed as an attractive residential community, with smooth, well-shaded streets, ample park and recreation space, including water-front places, and a high percentage of private dwelling houses. A special city-planning committee is now working out a comprehensive program for the improvement of the public buildings, thoroughfares, and parks, and the next decade will reveal notable changes in the appearance of the city. The business section extends north from the lake front, and from here the principal business thoroughfares radiate. Main Street extends north and northeast to the city limits; Delaware avenue, a parallel street, is crossed about a mile from the business center by North, Summer, and Ferry streets, and by Delavan, Hertel, and Kenmore avenues. These streets are in the chief residence section. Niagara Street, branching from the foot of Main, follows the lake and river to Tonawanda, a suburb north of the city, and continues as River Road to Niagara Falls. From Niagara and Lafayette squares, in the downtown district, Broadway, Genesee, Clinton, and Sycamore streets extend eastward for several miles. The construction of new thoroughfares and the widening of old ones has increased the mileage of boulevards considerably. The county is widening to a minimum of forty feet of concrete twenty-four radial streets from the city line to the county line.

The already extensive park system of about 1,300 acres is also being enlarged and improved. Delaware Park, the site of the Pan-American Exposition in 1901, is on the north side; it

covers 365 acres, including a lake of forty-six acres. Contiguous to this park on the south is Forest Lawn Cemetery, with 230 acres, in which are monuments to President Fillmore and the Indian chief, Red Jacket; west are the grounds of the state insane hospital, 230 acres in extent. Grover Cleveland Park, covering 128 acres on the extreme northeast, is one of the newer city parks. Cazenovia and South parks, the latter possessing a fine conservatory of plants, are the largest reservations on the south side. Humboldt Park, which contains the new building of the Buffalo Society of Natural Sciences, is the largest east side park.

Buffalo's water front is being constantly developed. One of the older parks in this district is called "The Front"; a tract of forty-five acres



Photo U & U

INTERNATIONAL PEACE BRIDGE

It is a link of friendship between the two great English-speaking nations of North America.

along the cliffs overlooking the lake at the head of the Niagara River, it commands a splendid view of the water and the Canadian shore. North of this park are the grounds formerly occupied by a United States military post, Fort Porter, which the city purchased in order to transfer a portion to the Buffalo and Fort Erie Public Bridge Company. From this point the new vehicular and pedestrian Peace Bridge, opened in 1927, crosses the river to Fort Erie, on the Canadian side. These areas, together with the Bird Island Pier development and other land to be reclaimed by filling in, will eventually form an extensive water-front park of impressive beauty. A part of the city-improvement plan is the construction of a parkway extending from the edge of the water at Porter Avenue across the city to Humboldt Park, on the east side. By means of connections with the Peace Bridge, this boulevard will form a link in the chain of driveways threading the Niagara district on both sides of the river.

The construction of several new public buildings, in connection with a system of harmonious grouping, is another feature of the city plan. It is proposed to give the city a series of five centers—administration, courts, recreation, cul-

ture, and education. Among the buildings already under construction is the City Hall, costing six and one-half million dollars, one of the administrative group that is to form the civic center at Niagara Square.

any other city. Its huge grain elevators have a combined storage capacity of nearly 40,000,000 bushels. Large quantities of the lumber and iron ore are docked at Tonawanda. Buffalo is one of the largest American livestock markets for horses, cattle, sheep, and hogs, and annually distributes more than 15,000,000 pounds of fish over territory from Boston to Denver.

The shallow mouth of Buffalo Creek was the original harbor. It has been deepened, and a ship canal for wharfing has been built from this harbor south-



IN BUFFALO

View of the Inner Harbor—Lafayette Square and Monument

Transportation and Commerce.

Located at the intersection of the Great Lakes and the Barge Canal, and at a point where eleven railroad trunk lines converge, Buffalo has unexcelled transportation facilities for the shipper and the traveler. The through railroads operating in the city are the New York Central, the Pennsylvania, the Buffalo, Rochester & Pittsburgh; the Delaware, Lackawanna & Western, the Erie, the Grand Trunk division of the Canadian National, the Lehigh Valley, the New York, Chicago & Saint Louis; the Michigan Central, the Pere Marquette, and the Washington. The New York Central, the Erie, and the Lackawanna operate belt lines within the city, and two industrial roads serve the inner harbor—the Buffalo Creek and the South Buffalo. There are twelve freight terminals and five passenger stations, 45,000 trains a year entering the former, and 90,000 passenger trains entering the latter.

On the basis of tonnage, the port of Buffalo is given fourth rank in the United States by the Federal Shipping Board; New York, Duluth, and Los Angeles precede it. Though open for commerce but eight months of the year, the port is one of the leading shipping centers in the world, its annual tonnage ranging from 17,000,000 to nearly 20,000,000.

The extensive water-borne commerce of the Great Lakes, consisting principally of grain and flour, lumber, coal, iron ore, and merchandise, is here reshipped to be sent by smaller craft and by rail to other cities and to the ports of the Atlantic seaboard. Buffalo handles more wheat, flour, and coal in transit than



ward, parallel with the lake shore. Inner and outer harbors in the lake have been created by a series of breakwaters. One nearly five miles long, constructed by the United States government, is among the largest breakwaters in the world. The government has also built a large lock in the Black Rock harbor, between Squaw Island and the mainland, to accommodate boats to and from Tonawanda. Buffalo has a total water frontage of 37.4 miles, of which two-thirds has been improved.

An international bridge, completed in 1873 at a cost of \$1,500,000, spans the river from Squaw Island to Bridgeburg, Canada. The construction of the vehicular Peace Bridge was financed by a \$4,500,000 bond issue. This bridge was named with reference to the state of peace that had been maintained between Great Britain and the United States for a century. Buffalo operates several lines of ferries to

the Canadian side, and has direct boat connection with Lake Ontario and the Saint Lawrence River by way of the Welland Canal. (This canal and the New York State Barge Canal are described elsewhere under their own titles.)

Manufactures. In value and extent of manufactures, Buffalo ranks second to New York City in the state, and its industries embrace nearly eighty per cent of all those recognized by the United States Census of Manufactures. The city is the largest American center for aniline dyes, one of the largest pig-iron producers in the world, and one of the three leading American cities in the manufacture of linseed oil. It is second only to Minneapolis as a flour-milling center. At Lackawanna, a southern suburb, the Bethlehem Steel Company operates one of the largest plants in the world. This factory and two other steel plants in the city have a yearly production of about 2,000,000 tons of finished steel products. One brand of automobile tires, used the world over, is the best-known of a wide variety of rubber products manufactured in the Buffalo district.

The city is also an important center for meat packing, printing and publishing, foundry and machine-shop products, and for the manufacture of livestock feed, breakfast cereals, furniture, and other lumber products, aircraft and aircraft equipment, and automobiles. It possesses the only plant in the world manufacturing cellophane, a cellulose plastic. In the 1925 Census of Manufactures, it was eighth city in value of manufactures. In the Buffalo-Niagara Metropolitan District the value of manufactures for the census year was one billion twenty-four million dollars.

History. When it was yet the red man's country, herds of buffalo visited the salt licks in the region occupied by the present city, and some historians associate their name with the first settlement. La Salle, in 1679, built near here the first ship navigated on Lake Erie, the *Griffon*, and erected a fort, which was soon destroyed by fire. Cornelius Winney, an Indian trader, the first permanent white settler, arrived probably about 1788. A large tract of land, which included the present site of the city, was purchased in 1790 by the Holland Land Company. Joseph Ellicott, the agent of the company, later known as the founder of Buffalo, platted the city in 1801 and 1802, after the plan of the city of Washington. The place was called New Amsterdam until 1801.

During the second war with Great Britain, the territory about Niagara Falls was the scene of active military operations, and in 1813 Buffalo was almost completely destroyed by a force of British and Indians. The settlement, which had been incorporated as a village in 1813, was rebuilt after the conclusion of peace, and its importance as a trade center was apparent as commerce developed on the Great Lakes. The Erie Canal was completed in 1825, and from that time the town developed rapidly. It became a city in 1832. The first grain elevator in the world was erected in Buffalo in 1843. In 1852, Black Rock, a village to the north, and Buffalo's trade rival,

was annexed. Millard Fillmore and Grover Cleveland made Buffalo their home, and Cleveland was mayor of the city when elected governor of New York, in 1882.

With the utilization of power from Niagara Falls, in 1896, the city entered upon a new industrial era. The Pan-American Exposition was held in Buffalo from May 1 to November 1, 1901, and proved an incentive to further expansion by making known Buffalo's advantages of location. From 1916 to 1928 the city was under the commission form of government, returning in the latter year to the aldermanic form of government.

In September, 1926, the formal opening of the Buffalo Airport took place. The opening of the Peace Bridge, in August, 1927, was the occasion of impressive ceremonies, in which Vice-President Dawes, Governor Alfred E. Smith of New York, the Prince of Wales, Prince George, and the Premiers of England and Canada participated. W.N.K.

BUFFALO BILL. See CODY, WILLIAM FREDERICK.

BUFFALO BUG. See CARPET BEETLE.

BUFFALO MOTH. See CARPET BEETLE.

BUFFALO PARK. See ALBERTA (Animal Life).

BUG. While this name is popularly applied to almost any insect, the entomologist uses it in a special way. Scientifically, the true bugs constitute the suborder *Heteroptera* in the order *Hemiptera*. All species possess a horny, jointed beak, attached to the head and adapted for piercing the skins of plants and animals. Through this organ, the bug sucks the plant juice or blood of its prey, for these insects have no biting mouth parts. There are both winged and wingless forms, and many variations among the species as to size, appearance, and habits. Among the true bugs are several species that damage crops, but the injurious kinds probably are outnumbered by the harmless ones.

Certain other insects having *bug* as a part of the name, such as the June bugs, tumblebugs, and potato bugs, are really beetles (see BEETLE). W.J.S.

Related Subjects. The reader will find supplementary information in the articles INSECT and HEMIPTERA. The true bugs described in these volumes are listed below

Bedbug	Squash Bug
Chinch Bug	(under Squash)
	Water Bug

BUG BIBLE. See BIBLE (Famous Versions of the Bible).

BUGLE, a treble wind instrument, of brass or copper, but originally made of horn. It resembles the trumpet, but has a shorter tube and a smaller bell-shaped opening. The tone of the trumpet is brilliantly blaring, while that of the bugle is softer, with a penetrating quality. The bugle is used chiefly for sounding the calls to the infantry; the trumpet, to the cav-

alry. In peace, the soldier is reminded of every routine duty by a special call from a bugler.

Bugle Calls. The routine of life in the army barracks is marked by bugle or trumpet calls, from the *reveille*, which calls the soldiers from their slumbers, to *taps*, when the day is done. There are warning calls, formation calls, alarm calls, and service calls. The accompanying calls are from the *Infantry Drill Regulations* of the United States army.

BUILDING. Since the days when men dwelt in caves, which, like Polyphemos in the *Odyssey*, they shared with their flocks, mankind's knowledge of the science of building has kept pace with advance in other fields. Though the peasants of parts of the civilized world still live in sod hovels, Eskimos in huts of ice, Malays in tree-top shelters, and present-day Indians of the American Southwest in houses of adobe, their more civilized brothers have learned how to erect beautiful homes and magnificent work-places of stone, brick, concrete, steel, or timber. The stages through which structural skill has passed, and the principal types of buildings, are described in the article **ARCHITECTURE**; this is the story of how modern buildings are constructed.

The Architect. In ancient times, architecture was regarded as chief among the arts, and the designer of a building was given complete charge over the sculpture and paintings which went into the structure. To-day the architect is at least equally important. He not only makes the plans and designs of buildings, but he draws the specifications for them, and usually su-

Slow TAPS

Moderate RETREAT

Quick BOOTS AND SADDLES

Quick REVEILLE

End

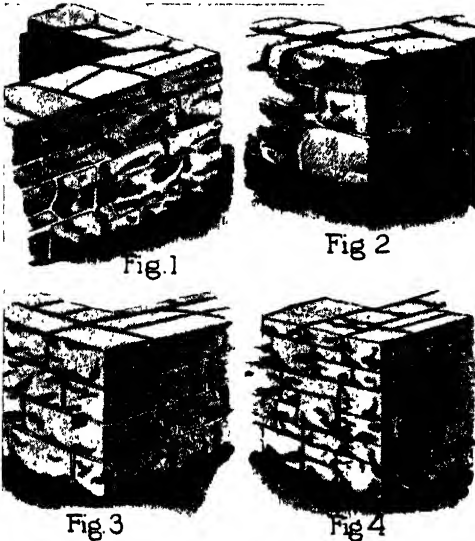
D.C.

perintends their execution. Without the architect's minutely detailed blueprints, the contractor would not know how to proceed with the erection of the building. The architect makes the specifications with which the contractor must comply in submitting his bid, and he watches construction carefully, to see that instructions are carried out in every detail. To do his work intelligently, the architect must be not merely a draftsman; he must know the costs of labor and materials, and must understand the engineering principles involved in construction work. His compensation for his labor is usually a commission, but may be a set fee, paid by the owner of the building.

Building Trades. To erect a skyscraper, the labor of hundreds of men is required. Each has a particular kind of work—digging, shoveling sand, erecting the steel work, putting in place the hot steel rivets, laying the stone, bricks, or blocks of terra cotta, plumbing, wiring for electricity, finishing walls or floors, or one of a hundred other tasks. On smaller buildings, the work is divided into trades in the same way, and even to build a small frame house, excavators, masons or cement workers, carpenters, and bricklayers are required.

Contracting. The men who supervise all these workers are usually called *contractors*. Sometimes a contractor agrees to erect a building for a stated amount of money, and if, through careful direction of his men and wise buying of materials, he is able to do it with less expense than anticipated, the saving adds to his profit. In

other cases the owner of the building pays all expenses, also a commission to the contractor. Frequently, a contractor will engage others to do part of the work; thus plumbing, wiring, plastering, and similar tasks



HOW BUILDING STONE IS LAID

- (1) A rubble wall
- (2) Field stone
- (3) Ashlar, in which all stones are squared.
- (4) Random-coursed ashlar.

are often handled by *subcontractors*. To be a successful contractor, a man must possess a thorough knowledge of building principles, be able to estimate costs accurately, and have the ability to govern others and to direct their operations so that good work will be done without waste of time. Many contractors have risen from the ranks of laborers. See ARCHITECTURE.

The Substructure. The two parts of a building, the substructure and the superstructure, might theoretically be termed the below-ground and the above-ground sections. But the substructure includes the basement walls, which in actual practice sometimes extend many feet above the ground level.

Footings. The narrow end of a shingle can be pushed into the earth and the edge of a board can be driven in, but the flat side of a plank will support a very large weight without sinking. If the foundations of a heavy building are set directly on the soil, they will penetrate it, like the shingle, but if they are built on *footings*—which, like the plank, are sustained by a greater area of ground—they can be made nearly as solid as though on rock. Footings may be of concrete, reinforced concrete, flat stone, stone and brick, concrete and brick, and steel or timber. In very soft ground, they are

sometimes set on piles, as they are for moderately tall buildings of many large cities.

For any except a light frame structure, the builders are always very careful to determine the proper size of footings according to the character of the soil and the weight of the building. An example of what will happen if the load is not evenly distributed to the footings is given in the illustration. Most large buildings have *isolated footings*, with the size of each one proportioned according to the average load it will be called upon to bear. The reason for making the average load the basis of the plans will be clear if one will suppose the case of a store building, in the back of which are to be kept the tons of stock, but the front of which is lightly loaded except when crowds fill it on special sale days. If the footings are proportioned according to the greatest load at any one time, those in front will be stronger, and the average load will cause those at the back to settle more rapidly. On the other hand, each footing must be large enough to support its share of the greatest possible load, which includes (1) the *dead load*, or weight of the building itself; (2) the *live load*, or weight of the people and objects which may at any one time be in the building; (3) the *snow load*, *wind load*, and other emergency strains.

Footings must always be constructed below the point to which frost penetrates the ground,



EXAMPLES OF FOOTINGS

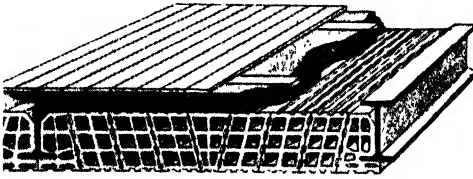
1 A continuous footing under an opening will cause cracks, because, as shown by the arrows, the downward pressure is all at the sides, and there is in effect an upward thrust at the center, which will "break the back" of the arch. 2 Isolated footings, formed by omitting that part of the footing beneath the opening, allow uniform settlement, because all upward force is directly under the downward pressure.

or they will move to and fro and cause cracks in the walls above.

Foundations. Besides supporting the superstructure, foundation walls must withstand the inward thrust of the earth and, if there is a cellar, keep out dampness. Stone or concrete foundations are built at least eight inches thicker than the wall next above them. Stone is to some extent spongelike, brick is more so, and concrete walls admit water readily unless covered with tar, asphalt, or other water-proofing substance.

The Superstructure. The details of this part of a building vary widely, according to the materials of which its frame is composed.

Brick buildings are of two sorts, those which have brick walls from twelve to forty inches thick, and those with wooden walls and a brick



FLOOR OF FIRE-PROOF BUILDING

The hollow tiles, which are supported like an arch, are covered with concrete before the wood floor is laid.

veneer only four inches thick. Both types are often constructed with air spaces in the walls as an aid to dryness and warmth. Sometimes stone is used on the outside and brick on the inside, the two materials being bonded together.

The more windows there are in a brick or stone wall the more danger there is that cracks will appear; the principle of this is exactly that illustrated above concerning footings. If window and door openings in upper stories are directly over those below, as in colonial architecture, the danger is less. The distribution of weight is also to be considered in placing stone steps, sills, or lintels. Sills are of two types, *slip* sills and *lug* sills. The former are just the width of the opening which they border; the latter enter the wall a little at each end. Lug sills and stone steps are supported by mortar at the ends only; in other words, they are given isolated footings. A lintel is a beam supporting the wall over an opening; it is inserted into the brickwork only a few inches at each end.

Steel Frames. Skyscrapers have skeletons of steel which carry the weight of the whole structure. The walls of each story, called *curtain walls*, bear no weight but their own, and are usually of stone or brick. The floors are of hollow tile, which, though flat on their surfaces, are built on the principle of an arch, with a keystone in the center and all the weight thrusting against the I-beams at the side, as in the illustration. An explanation of the use of I-shaped beams will be found in the article BRIDGE.

Related Subjects. A more detailed knowledge of the materials and principles in use in building will be found in the following articles:

Adobe	Calcimine
Brick	Carpentry
Building Stone	Cement
Bungalow	Concrete

Fireproofing

Fluting

Glass

Granite

Iron

Limestone

Lumber

Marble

Mohammedan Architecture

Mechanic's Lien

Nails

Pile

Plastering

Plumbing

Roof

Sandstone

Shingles

Staff

Strength of Materials

Steel

Stucco

Terra Cotta

Tiles

Wire Glass

See, also, the articles listed under ARCHITECTURE

BUILDING AND LOAN ASSOCIATIONS, OR BUILDING SOCIETIES, are private organizations whose primary object is to make it possible for people of small financial resources to own their homes. This is accomplished by lending the savings of all the members to the few who at any one time wish to build or to buy a home. By repaying the loan in regular installments, the borrower eventually becomes a home owner. In most of the states and Canadian provinces, as well as in many European countries, the operations of building and loan associations are strictly controlled by special laws. There are now over 12,000 local associations, with assets over \$8,000,000,000. All such societies may be divided into two classes, private corporations and mutual companies.

Private Corporations. Private associations are operated for the profit of the shareholders. The corporation receives money on deposit like an ordinary savings deposit, and pays interest therefor. These deposits it lends to people who wish to build homes. The borrower mortgages the new home as security, and agrees to repay the loan in installments. The borrower pays a higher rate of interest than the depositor receives, thus giving the corporation its profits.

Mutual Companies. In a mutual company, every depositor is a stockholder. A stockholder who wishes to borrow money subscribes for the number of shares which equal in par value the amount he wishes to borrow. He pays for this stock in small installments, and he also pays interest on the loan. If he is unable to complete the payments, he must surrender possession of the house and land, which becomes the association's property. If he completes the payments on the stock, the mortgage on the property is automatically cancelled.

A mutual company has no capital except the weekly or monthly payments of the members. This capital naturally grows from year to year. It sometimes happens, however, that the amount available for loans is less than that required by a number of the members. In such case, the money is usually loaned to the one who offers the highest bonus over the regular interest.

As only a few of the members can borrow the accumulated capital at any one time, the

others must continue their payments, with the intention of borrowing at some future time. Members are always allowed to withdraw, but few of them do so, as they then lose a part of the savings already invested in the shares.

BUILDING STONE. There are a number of varieties of stone used in the construction of piers and bridges, in the foundations and walls of buildings, and in the finishing of interiors. These stones are known to the building trades as *building stones*. Those most extensively used in the United States and Canada are granite, limestone, marble, and sandstone. In finishing exteriors, onyx, marble, and slate are most frequently used. Each of the stones named above is described under its title in these volumes. See illustration, page 1010.

In selecting the stone for a building or other structure, the architect or engineer is governed by the following considerations:

1. Strength required.
2. Durability.
3. Convenience of access
4. Expense of working.
5. Architectural effect.

Granite is the strongest and most durable stone. It is usually selected for foundations of heavy structures and for piers, and it is frequently used for the walls of large buildings.

Limestone in great variety is also used for foundations, walls, and trimmings. It is not so strong as granite, but it is an excellent stone for all ordinary foundations and walls. *Marble* is softer than ordinary limestone, and is now practically restricted in its use to stairways, interior finishings, and ornamental work.

Sandstone of hard quality is used for expensive dwellings such as the "brownstone" structures once famous in large cities. It is more brittle than limestone, and will not withstand so great a pressure. *Slate* is used for interior work in sinks, mantels, and other furnishings. It is very durable.

Durability. The causes affecting the durability of building stone are the action of air and rain (weathering), change in temperature, and chemical changes within the stone. Weathering is the chief cause of change. If the stone is porous, it may absorb small quantities of moisture from the air and from rain. When the temperature falls below the freezing point, this water freezes and expands; the next season more water enters, effecting a further change, until finally the surface begins to crumble. The presence of iron or sulphur in the stone is likewise a source of weakness. The iron, on exposure to the air, discolours the stone, and the sulphur is apt to unite with oxygen, forming sulphuric acid, which attacks the structure of the rock.

Building stone usually withstands the climate better if used near the locality where it is quarried. Many fine public buildings have

rapidly lost their beauty because they were constructed of stone brought from a considerable distance.

The following table shows the life of the stones described, before they begin to show deterioration:

KIND OF STONE	LIFE IN YEARS
Coarse brownstone.	5 to 10
Fine brownstone	20 to 50
Coarse fossiliferous limestone.	20 to 40
Marble, coarse dolomitic	40 to 50
Marble, fine	50 to 100
Granite	100 to 200
Best Ohio and Indiana limestone	100 to 200
Nova Scotia sandstone.	50 to 200

The above variations in years are due not only to quality of the stone, but to the location of the building of which the stone is a part.

BUKOWINA, *hoo ko vee' nah*. See RUMANIA (Historic Provinces).

BULB, the underground storehouse of a plant. A bulb is a form of underground stem, whose very compact leaves, through storage of food, have become thick and fleshy. Like a seed, a bulb holds within it the undeveloped



SOME COMMON BULBS

(a, b) Lily, entire and cross-section; (c) early red onion; (d) narcissus; (e) hyacinth; (f) tulip.

plant of the future—leaves, flower, and all. But, unlike the seed, a bulb has much stored-up nourishment, and a plant grows more quickly from the bulb than from the seed. Some bulbs are formed in rings or layers, like onion and hyacinth bulbs; others are scaly, like those of the lily. If put in the ground at the right time, which depends entirely upon climate and

season conditions, and if given the proper attention and continued nourishment, a bulb will soon send forth roots from the bottom. And from the center, up through the ground will come the leaves, stems, and flowers.

Bulbs should be distinguished from other forms of underground stems—*rhizomes*, *tubers*, and *corms*. The rhizome is a rootlike stem; the tuber, as exemplified by the potato, is an underground stem with a greatly thickened portion at the end; the corm is a rounded object like a bulb, but the stem part is more prominent than the leaves (see CORM). Bulbs and other underground

stems serve to store food for the plant in climates where the growing season is short and there are long, cold winters. Each bulb produces a plant exactly like the parent. The onion is the most important bulb from a practical standpoint, but many bulbous plants produce fragrant flowers of wonderful charm and interest. B.M.D.

Related Subjects.

All of the bulb plants mentioned in this article are described in these volumes under their own titles

BULFINCH, CHARLES, an American architect. See BOSTON (Notable Modern Buildings); WASHINGTON, D. C.



Photo. Visual Education Service

BULBS AND TUBERS

The dahlia, onion, potato, and hyacinth

(Notable Modern Buildings); WASHINGTON, D. C.



BULGARIA, *bul ga' ri ah*, a constitutional monarchy in the eastern part of the Balkan peninsula of Europe. It is bounded on the north by Rumania, on the east by the Black sea, on the south by Turkey and Greece, and on the west by Yugoslavia. By the Treaty of Bucharest, which represents the final settlement of the Balkan Wars of 1912-1913, Bulgaria received an increase of sixteen per cent in territory. But that gain was reduced by the World War, in which Bulgaria, as an ally of Germany, lost a part of its annexed territory. The actual area is 30,814 square miles, which makes Bulgaria about the size of Ohio. The population is 5,715,000. It is said that the name *Bulgaria* is derived remotely from that of the Volga, the river on which a Bulgar kingdom was located, but modern historic research does not confirm that version.

The People and Their Condition. Bulgarians constitute about seven-eighths of the population of the country; the second race in point of numbers is the Turkish, of which there are about 466,000. The native Bulgarians are

not a quick, brilliant race, but they are determined, and are willing to work very hard for anything that seems to them desirable. One of the things which has seemed most desirable to them is education. Even while the Turks were crushing them, schools were maintained, and when freedom was achieved, these increased and improved rapidly. Primary education is free and compulsory, and there are normal schools and colleges of excellent grade, commercial, industrial, and trade schools, and a number of agricultural schools, including stations where practical instruction in agriculture is given. There are in Sofia two universities, with professors of excellent reputation. With respect to literacy of the young generation, Bulgaria holds the seventh place in Europe.

The Bulgarian Church, a branch of the Greek Orthodox, is the church of over eighty per cent of the people. Other religions are not molested, however, and many of the cities have a numerous population of Mohammedans. The government pays the salary of the clergy both

of the State Church and of non-orthodox churches.

The Cities. The three principal cities of Bulgaria are Sofia, the capital; Philippopolis, the chief commercial center; and Varna, the principal Bulgarian port on the Black Sea. A description of each follows:

Sofia, *saw' fe yah*, known as *SREDEC* (*sreh' deti*) by the Bulgarians and so designated on European maps, is the capital and largest city, situated in the western part of the country on an elevated plain 1,800 feet above the sea. It is connected by rail with the chief cities of Europe. Since 1878, Sofia has been practically rebuilt into a completely modern city.

Among the notable buildings are the palace of the king, a cathedral, the buildings of the university (founded in 1888), a large theater, and the government buildings.

Sofia is the foremost railroad and industrial center of Bulgaria; it has thriving manufacturing establishments, and carries on a prosperous export trade in foodstuffs, attar of roses, and hides. The present city is on the site of a Roman town called Sardica. In the older portion are some famous mineral springs. Sofia was bombarded by allied airships during the World War. Population, 1926, 213,120.

Philippopolis, *fu ip op' o lis*, or *PLEVDIV*, on European maps, the second largest city, was almost completely destroyed by an earthquake in 1928, but reconstruction was rapid. It is situated on the Maritsa River, about ninety miles southeast of Sofia, or practically midway between Sofia and Adrianople. As the chief commercial center, it has an active trade in silk, cotton, attar of roses, tobacco, rice, and grain. Population, 1926, 84,980.

Varna, *var' nah*, the principal seaport, is on the Black Sea. It carries on extensive trades in grain, silks, cotton, dairy products, and domestic animals. Varna has been the scene of many wars; the Hungarian defeat by the Turks in 1444, the Russian attacks in 1773 and 1828; the Crimean War in 1854, and the World War in 1915, all left their devastating marks. But because of its extensive trade, it has survived the disasters of war, and still is an important city. Population, 1926, 60,760.

The Land and Its Resources. The Danube River runs along the northern boundary, and it is the valley of that stream which forms the northernmost of the three physical divisions of Bulgaria.

South of this stretch are the Balkan Mountains, with peaks which reach heights of 10,000 feet; beyond these is a lowland region, the fertile valley of the Maritsa; to the far south are the Rhodopo Mountains. The valleys of the Danube and the Maritsa are the most fertile of the entire Balkan peninsula, and the mountain regions are rich in

minerals. Springs, long famed for their medicinal qualities, are numerous. Oak, pine, and beech grow on the northern slopes, but the great, dense forests which once covered them have largely disappeared; the Turkish government encouraged their destruction to prevent highwaymen from finding shelter in them.

Differences in climate are as well marked as those in surface. The territory north of the Balkans is colder than that of the south, as the Balkan Mountains protect the latter from



OTHER COMPARATIVE AREAS

Pennsylvania is slightly larger, with 44,842 square miles, while Bulgaria has 40,656

the north winds. South of the mountains a fine, temperate climate is found, but only in the extreme south is there such a climate as, for instance, prevails in Italy. Bulgaria lies in about the same latitude as the middle regions of Italy, but much of it is shut off by the mountains from the warm, moist Mediterranean winds.

The country in late years has witnessed a steady development of the mining industry; however, this is still in a backward state, due to the lack of capital and railroad communication. Since the World War, the mining of coal has increased so that importation is unnecessary, and exportation is often possible. Several copper mines are being worked, and there is some lead, iron, zinc, and silver mining.

Agriculture is the chief industry, almost three-fourths of the population maintaining themselves by it. Modern farming implements have taken the place of crude wooden plows, and reaping, threshing, and winnowing are now performed with the aid of efficient machines instead of by hand. The land in Bulgaria belongs to the farmers and not to the government; there are no large land proprietors, and out of nearly 934,000 farms, 000,000 have less than fifty acres each. The most important crops are the grains, which are grown in quantities large enough for export. Potatoes are also grown extensively, and in Eastern Rumelia, rice and cotton flourish. Tobacco-raising, the production of cocoons



LOCATION MAP

for silk, sugar beets, and apiculture (bee-raising) are also important. While before the war the principal exports of Bulgaria were grains and beverages, after the war the first place was taken by tobacco. The most interesting industry to a visitor is the raising of roses for the perfume "attar of roses." In the southern valleys of the Balkans roses grow in profusion; great quantities of them are needed, for it takes over 6,000 pounds of rose leaves to make one pound of attar, and Bulgaria produces 9,000 pounds of attar annually. See ATTAR OF ROSES, page 495, for illustration.

Transportation and Trade. Had Bulgaria been off the direct line of trans-European travel, it might have remained obscure and unimportant; however, the shortest route from Western Europe to Asia lies through its territory. Branch roads run from this route, but it is not on these nor on the main line that Bulgaria depends for transporting its products. A large part of its exports goes by way of the Danube, and much of the foreign trade is with Austria, Germany, and Hungary.

Tobacco, attar of roses, fruits, and animal products are exported, while the chief imports are textiles, metal goods, petroleum, and coal. Although the bulk of the population is busy with agriculture, the Bulgarians have shown themselves proficient also in commerce and trade, as is proved by the many and various commercial and industrial enterprises and the number of banks. Lack of capital is Bulgaria's greatest obstacle to rapid development.

Government. Bulgaria is a constitutional monarchy, under a new Constitution which dates from 1908. The king, called czar in Bulgaria, acquires the crown by hereditary succession. He nominates a Cabinet, which is a Council of Ministers with executive power. Legislative power is vested in the Narodno Sobranie (National Assembly), which is composed of representatives elected by universal male suffrage, and there is one representative for every 20,000 inhabitants. For the administration of local government, Bulgaria is divided into seventy-one districts, each having a prefect at the head.

History. During Roman times, present-day Bulgaria was Roman territory, partly Moesia, partly Thrace. Over the plains to the eastward came first the Slavs, and later the Bulgars, relatives of the Huns; and since neither was strong enough to drive out the other, a gradual blending took place which resulted in the Bulgarians of to-day. In 864 they accepted Christianity, and from them the Church language and Church, as well as secular, literature were introduced into Russia. For a time, the Bulgarian state was a strong enemy of the Byzantine Empire (which see), but in the fourteenth century it fell a prey to the Turks.

Five centuries passed before the Bulgarians were strong enough to resist the Turks; even then, the first insurrection, in 1876, was comparatively slight.

The Turks, however, punished the subject people severely, committing those unspeakable "Bulgarian atrocities" which roused statesmen everywhere to denunciations of the Turk. Russia, whose people are akin in race and in religion to those of Bulgaria, undertook to right Bulgarian wrongs, though not with a purely unselfish motive, and the result was the Russo-Turkish War. Turkey was defeated, and by the Treaty of San Stefano (March, 1878) a Bulgarian principality was created, including all the Bulgarian provinces, among them Macedonia. As a consequence of the opposition of Austria-Hungary and Great Britain, Bulgaria was reduced by the Treaty of Berlin (July, 1878) to a small, semi-independent principality under the nominal suzerainty of Turkey. The country progressed steadily. It chose as its prince the German Alexander of Battenberg, and when he abdicated, in 1886, Ferdinand of Coburg was selected. Meanwhile, in 1885, Eastern Rumelia had united with Bulgaria, and this resulted in a sharp clash with Serbia, in which, to the amazement of Europe, Bulgarian armies were victorious.

In 1908 Bulgaria took advantage of the internal troubles which were occupying the attention of Turkey to declare itself independent. Prince Ferdinand then assumed the title of king. But a greater crisis in Bulgarian affairs occurred in connection with the Balkan Wars, of 1912-1913. With the other Balkan states—Serbia, Montenegro, and Greece—Bulgaria was victorious over Turkey, its armies proving themselves well disciplined and courageous. Turkey was forced to give up almost all its European territory, but a dispute arose between Bulgaria and its allies, because the latter, especially Serbia, refused to abide by the treaty which regulated the division of the conquered territory and gave the greater part of Macedonia to Bulgaria. The result was another war, in which Greece, Serbia, Rumania, and Montenegro joined against Bulgaria, with entire success. Exhausted, Bulgaria consented to a peace which gave to Rumania a portion of its northeast territory, the Southern Dobrudja, and permitted it to annex but a fraction of the land which had been won from Turkey. Bitter was the disappointment caused in the young, self-confident nation, and had not its resources been well-nigh exhausted, it would probably have renewed the struggle.

In October, 1915, Bulgaria entered the World War as an ally of the Central Powers, Germany and Austria-Hungary. For the course of that gigantic struggle, see WORLD WAR.

Bulgaria's strong desire for a separate peace; the hope that peace would be founded on the

principles of President Wilson's message advocating self-determination of peoples; the invasion of the country by Allied forces; and the dissatisfaction of the soldiers, led to the signing of an unconditional armistice on September 20, 1918. Subsequent political disturbances caused King Ferdinand to abdicate and flee the country, on October 3; he named his son Boris as his successor. The prince was proclaimed at once as King Boris III, and still occupies the throne, a popular ruler.



KING BORIS

The Bulgarian treaty of peace, called the Treaty of Neuilly, was signed on November 27, 1919, by Stamboulisky, the Agrarian party leader, who had been appointed Premier. By the treaty, Bulgaria lost territory on the north (the Southern Dobrudja, which Bulgaria had recaptured during the war) to Rumania; on the west, to Yugoslavia and Greece (Macedonia), and on the south to Greece (Western Thrace), and was thus cut off from the Aegean Sea. Access to this sea was promised by the principal allies in a clause of the treaty, but attempts at fulfilling this promise have not been satisfactory to Bulgaria, and the country remains without an Aegean port.

This loss of territory, the harsh financial terms of the treaty, and the loss of population (for each of the ceded areas had included a Bulgarian majority) made the people bitter against those who had been responsible for their entering the World War. Stamboulisky as Premier announced that he intended to fulfill his treaty obligations and keep peace with his Balkan neighbors, but relations with Greece and Yugoslavia were strained. He led a definite campaign against the bourgeoisie (the upper classes), and although he denied that he was a communist, he later allied himself secretly with those communists who were in his own country. The repressive measures of his government, combined with the general reaction against its failure to gain any diplomatic or economic advantages for Bulgaria, resulted in 1923 in its being overthrown by a group of intellectuals, bourgeoisie, and army officers, with Tsankov, a university professor, as their leader. In a short-lived rebellion by arms against the new government, Stamboulisky was killed.

Relations with Greece became more difficult in 1923, and were brought to a head by outrages on Bulgars in Greek Macedonia. In 1924,

after lengthy negotiations, Greece and Bulgaria, under the supervision of the League of Nations, signed an agreement as to the rights of national minorities within their borders, but this was later repudiated by Greece.

Disorder within Bulgaria continued, particularly in relation to Macedonian difficulties. The agitation resulted in 1924 in about two hundred assassinations, most of them political. On April 14, 1925, an attempt by armed bands from abroad was made to assassinate King



Photo U & U

THE CATHEDRAL AT SOFIA

The scene of the bombing outrage

Boris; on April 15, General Gheorghiev was murdered, and at his funeral on the following day, an explosion due to a communist conspiracy took place in the cathedral in Sofia, killing 123 people and injuring more than 300. The government at once proclaimed martial law, and took drastic steps to restore order. However, a general uprising did not follow, as was feared; many suspects were arrested and brought to trial.

The heavy burden of establishing more than 200,000 refugees from Thrace and Macedonia in Bulgaria was somewhat lightened by an \$11,000,000 "refugee loan" from the League of Nations in 1927. In 1926, the Tsankov government resigned, and the democratic Cabinet, under Liabchev, took command. One of its acts was the declaring of an amnesty to more than 6,000 political offenders. The internal affairs of the country have become more stabilized, and, except for the raids of bandits from the neighboring mountains and a border incident with Greece, which was settled by the

League of Nations, the country has enjoyed years of peace unusual for a country in the hotbed of the Balkans. S.R.

Related Subjects. The articles under the following titles will give added information on the subject of Bulgaria:

Balkan Peninsula	Danube River
Balkan Wars	Russo-Turkish War
Berlin, Congress of	Slavs
Boris III	World War

BULHAR, *bool' ahr*, a town in British Somaliland. See SOMALILAND.

BULL, a letter or order from the Pope, the head of the Roman Catholic Church, published or sent to local congregations. It is written in Latin, usually with elaborate lettering, dated from "the day of Incarnation," and named after the first word or phrase. The name *bull* comes from the seal used, which is a *bulia*, a round piece of lead impressed on one side with the heads of Saint Peter and Saint Paul, on the other with the name of the reigning Pope. If the bull be a "Bull of Justice," the seal is attached by a cord of hemp; if a "Bull of Grace," the cord is of red or yellow silk. G.W.M.

BULL, JOHN, the name popularly used to typify England and the English people, in the same sense that "Uncle Sam" typifies the United States and its people (see UNCLE SAM). It was first used by the witty Scottish doctor and writer, John Arbuthnot, in *The History of John Bull*, in which, in a discussion of the political affairs of Europe at that time, John Bull, representing England, appears as a jolly, honest, plain-dealing, but hot-tempered, farmer. Arbuthnot's word-picture was later reproduced in a drawing by Sir Francis Carruthers Gould, and now the name and the picture through long use have grown familiar to all. John Bull wears a "tall" hat, a swallow-tail coat, has trousers tucked in boots, and across his waistcoat appear the outlines of the British flag.



JOHN BULL

BULLA, *bul' lah*. See BULL.

BULL BAT. See NIGHTHAWK.

BULLDOG, a species of dog with fierce, savage eyes, leering features, and affectionate regard for its master—the best watchdog and one of the most faithful canine companions. It has been said that the bulldog is "so homely as to be positively beautiful."

Outline and Questions on Bulgaria

I. Position and Size

- (1) Latitude, 40° 45' to 44° north
- (2) Longitude, 22° 20' to 28° east
- (3) Area
 - (a) Comparative
 - (b) Actual
- (4) Population

II. The People

- (1) Proportion of Bulgarians
- (2) Other races
- (3) Characteristics of Bulgarians
- (4) Education and religion

III. Physical Features

- (1) Balkan Mountains
- (2) Lowland region
- (3) Rivers

IV. Climate and Vegetation

- (1) Distinct zones
- (2) Effect of mountains
- (3) Forests
- (4) Roses

V. Industries and Commerce

- (1) Agriculture
- (2) Mining
- (3) Manufacturing
 - (a) Attar of roses
- (4) Railway routes
- (5) Exports and imports

VI. Government and History

- (1) A constitutional monarchy
- (2) Its antiquity
- (3) Coming of the Bulgars
- (4) Acceptance of Christianity
- (5) Under Turkish rule
- (6) Independence achieved
- (7) Balkan Wars
- (8) World War

Questions

Why has not Bulgaria as warm a climate as Italy?

If the populations of Alberta and Bulgaria were exchanged, would the latter country be more or less densely populated than at present?

What industry helps to make the country regions delightful?

Is the executive or the legislature the more powerful?

What river and what mountains dominate the northern and the central physical divisions?

What fortunate fact of location has made Bulgaria important?

What great empire got its religion from Bulgaria?

Many years ago, to get just the right animal for the barbarous sport of bull-baiting, breeders crossed the British mastiff with the pug of Eastern Asia. And through careful



ENGLISH BULLDOG

Photo: Saint Clair

breeding and selection, we have the bulldog of to-day—with massive head, short, wrinkled muzzle, little, rounded nose, loose-hanging lips, and protruding lower jaw, with lower front teeth showing. The ears are drooping; the neck is thick and short. From the strong chest, held up by slightly bowed legs, the compact, short-haired body tapers to higher, straight hind legs.

The prize bulldog of the dog shows weighs about fifty pounds, and is brindle, red, fawn, white, or piebald. The close, tight grip of the jaws of the bulldog makes it a terror to thieves and others bent on mischief. Its faithful affection for its master and his family makes it usually a safe companion for children. The *bull terrier* came originally from a cross between the bulldog and the terrier. It is smaller than the bulldog, lively, and very courageous. See DOG; TERRIER.

M. J. H.



FRENCH BULLDOG

BULLET, a small projectile, from one to three inches in length, discharged from a rifle, pistol, revolver, machine gun, or similar firearm. The bullet used in modern rifles is conical in shape, and consists of a core of lead, covered with copper and zinc. In size, it varies according to the caliber bore of the

weapon used. Revolver bullets are heavier and shorter than those of rifles or machine guns, and the wounds they inflict are the more dangerous. It has been found that unless struck in a vital organ, such as heart or brain, sixty-five per cent of those wounded by rifle bullets to-day make speedy recovery.

At a distance of 1,500 yards, a modern bullet will penetrate six human bodies, one behind another. Bullets used for hunting big game usually have soft lead points, or are hollowed, to insure spreading when they reach their mark. So-called mushroom, or "dumdum," bullets have slight penetrating power, and often remain in the body struck. The use of such missiles is condemned in present-day warfare. Modern bullets are always held in a cartridge case, usually of brass.

Related Subjects. The reader is referred in these volumes to the following articles

Ammunition
Projectile

Machine Gun
Rifle

BULLFIGHT, a contest between men and bulls, the latter tormented and goaded to fury. This sport, frowned upon by all people except certain of the Latin races, was very popular among the Greeks and Romans, and was introduced into Spain by the Moors. It at once captured the fancy of the Spaniards, and became their national sport. During a portion of each year, called the bullfighting season, bullfights take place every day. Holidays and feast days are thus celebrated, and the skilled bullfighters are the popular heroes of Spain. In Mexico and Portugal, bullfighting, modified and less brutal, is a favorite pastime. The fights are usually held in an amphitheater having circular tiers of seats rising one above another, and are attended by vast crowds.

There are three kinds of combatants who make bullfighting their profession. They all march into the arena in procession, the *picadores*, combatants on horseback, in the old Spanish knightly garb; the *banderilleros*, combatants on foot, in gay dresses, with colored cloaks or banners; and lastly, the *matador*, also on foot, who deals the death blow to the defeated bull.

As soon as the signal is given, the bull is let into the arena. The *picadores* commence the attack with their lances, and the bull is soon infuriated. Often a horse is wounded or killed, and the rider is obliged to run for his life; sometimes men are seriously gored by the horns of the distracted animal. The *banderilleros* assist the horsemen by drawing the attention of the bull with their red cloaks, and try to fasten on the animal their *banderillas*—barbed darts ornamented with colored paper, which often have explosive crackers attached. In case of danger, the *banderilleros* and *picadores* save themselves by leaping over the fence which surrounds the arena.

The *matador* enters the arena with a naked sword and red flag; when the animal has afforded sufficient sport or is too weak to offer further resistance, he dispatches it with a skilful thrust. The slaughtered bull is dragged away, and another is turned into the arena. Eight or more bulls may be sacrificed in a single afternoon. See SPAIN.

BULLFINCH, a European singing bird which can be taught to repeat musical airs. In Germany great care is given to training bullfinches, and good singers command high prices. The bullfinch's name is no doubt derived from its thick, bulging bill, which makes its little head faintly resemble that of a bull. It is about the size of an English sparrow, and has a blue-gray body with a bright-red breast and a black beak and crown. It lives on berries, seeds, and the buds of fruit trees. D.L.

Scientific Name. The bullfinch belongs to the family *Fringillidae*. It is classed as *Pyrrhula pyrrhula*.

BULLFROG. This frog with a deep bass voice is found in Canada and the United States east of the Rocky Mountains, including Florida and Texas. He lives in ponds or lakes, where water is hidden from the shore by low trees



BULLFROG TADPOLES

(a) A developing bullfrog; (b) the same four days later, showing beginning of absorption of the tail

and bushes, weeds, and reeds and water lilies. Here he feasts on bugs, snails, shrimps, or toads and fish, seeking his food near the roots and stems and under the leaves of the sheltering water plants. When he is not searching for food or sleeping, one can see him basking in the sunshine on some half-hidden log. In the sunlight, his large body seems slightly yellow-green, but in the shade it is olive-green or reddish-brown, with large brown spots, and sometimes with yellow lines across the back.

The bullfrog is one of the largest species of frog, reaching a length of six to eight inches. All day and in the still summer evening, above the chorus of other little creatures, comes his loud, hollow "jug-o-rum." A powerful swim-

mer, he loves the water, and is rarely seen on land, excepting occasionally after long-continued rains. The hind legs of the frog are



BULLFROG

used as food, and also as bait for fish. See FROG. M.J.H.

BULLHEAD. See CATFISH

BULLION, *bul'yun*, the name given to gold and silver in any form except legal-tender coin. We usually think of bullion as bars of gold and silver brought to a mint to be made into coin. When anyone deposits bullion at a mint for coinage, it is carefully weighed, and its degree of purity is ascertained. A report is then made to the depositor setting forth these facts, together with a statement of the net value of the bullion deposited. If there are any charges or deductions, the amount of these is also stated. When the coins are ready for delivery, they are given to the depositor, on his order, by the superintendent of the mint. The name *bullion* is also applied to gold dust, gold nuggets, gold and silver plate, and foreign coins valued only as metal. See COINAGE; MINT. T.B.J.

BULLION STATE, a popular name applied to Missouri (which see).

BULL MOOSE PARTY. See MOOSE, sub-head

BULL RUN, BATTLES OF. See WAR OF SECESSION.

BULL TERRIER. See BULLDOG.

BÜLOW, BERNHARD HEINRICH, Prince von (1840-1929), a German diplomat and statesman, Prime Minister of Prussia and Chancellor of the German Empire from 1900 to 1909. After five years of retirement, he again became conspicuous in world politics late in 1914, when he was appointed ambassador extraordinary to Italy. The object of this appointment, which was due partly to von Bülow's personal popularity in Italy and partly to the fact that his wife was an Italian, was to use every possible influence to keep Italy from joining the Allies in the World War against the Teutonic powers. Although von Bülow's skilful diplomacy is given credit for delaying Italy's declaration of war, it could not prevent Italian adherence to the allied cause.

Von Bülow was born in Holstein, at that time still under Danish rule. His family had

been politically prominent for several generations, and his father, though originally in the Danish service, later entered the service of Prussia, and from 1873 until his death in 1879 was Secretary of State for Foreign Affairs. His son was naturally destined for a public career, and after serving in the army during the Franco-German War, entered the German Foreign Office. He was in turn secretary of legation at Rome, Saint Petersburg (now Leningrad), and Vienna, and was chargé d'affaires at Athens during the Russo-Turkish War of 1877-78. He was a secretary at the Congress of Berlin, at which his father was one of the three Prussian representatives. After further service in Saint Petersburg and Paris, he became minister to Rumania in 1888, and ambassador to Italy in 1893. Four years later, he was recalled to become Secretary of State for Foreign Affairs, and in 1900 succeeded Hohenlohe as Chancellor of the Empire.

BÜLOW, HANS GUIDO VON (1830-1894), a famous German musician, one of the greatest pianists and orchestra conductors of his century. He was born in Dresden, and began to study music at the age of nine. It was many years later, however, before he made up his mind to follow music as a profession, for he had expected to become a lawyer. In the year 1850, he attended a magnificent production of Wagner's *Lohengrin*, at Weimar, and at that time he resolved to become a musician. Soon after this, he went to Zurich to study under Wagner, whose genius he worshiped all his life, and later he was taught by Liszt at Weimar.

Bülow's public career began with a concert tour of Germany and Austria, in the year 1853. For many years afterward, he traveled widely, giving orchestra concerts in the various European countries and in America. He also held several important positions, being at different times head professor in a leading conservatory of Berlin, conductor of the royal opera in Munich, and court conductor to the Duke of Meiningen. The Meiningen orchestra, which he took with him on numerous tours, became the most famous in all Germany. His work as a conductor was remarkable because of his attention to details and his masterly interpretation of the music.

His Place in Music. Bulow was one of the best authorities on Beethoven, and he published an edition of the latter's works for the piano. His own compositions include the music to Shakespeare's *Julius Caesar*; a musical ballad entitled *The Minstrel's Curse*; a symphonic poem, *Nirwana*, and numerous songs, choruses, and pieces for the piano. His fame as a composer, however, is secondary to that as a pianist and conductor.

BULRUSH, a name applied to several different plants found in marshes. Species of *Scirpus*, in the sedge family, are known as

bulrush and club rush; their fibrous stems are sometimes used for matting, baskets, rush-lights, etc. To this family, but to a different genus, belongs the Egyptian papyrus, thought to be the "bulrush" from which the ark was made that cradled the infant Moses. A species of cat-tail is also known as bulrush, and the name is often given to the common rush.

G.M.S.

Related Subjects. The reader is referred in these volumes to the following articles:

Cat-tail	Papyrus	Rush	Sedge
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BULWER, JOHN, a pioneer in education of the deaf and dumb. See **DEAF AND DUMB** (*The Education of Deaf-Mutes*).

BULWER, SIR HENRY, one of the framers of the Clayton-Bulwer Treaty (which see).

BULWER-LYTTON, *bul' wur-lit' un*, the family name of two noted English writers, father and son.

Edward George Earle Bulwer-Lytton, first Lord Lytton (1803-1873), is best known as the author of that vivid historical tale, *The Last Days of Pompeii*. He was born in London, studied at Cambridge, where he won honor for facility in verse-making, and after his graduation spent some time in Paris. On his return to England, he became estranged from his mother because he made a marriage of which she did not approve, and he found himself obliged in some way to provide an income. He was practically forced into literature, and plays and novels followed one another in rapid succession, *Pelham* appearing in 1828, and *Kenelm Chillingly*, his last novel, in the year of his death. Meanwhile, he interested himself in politics, and sat in Parliament from 1831

to 1841 and from 1852 to 1866, where he attained considerable influence. In 1866 he was raised to the peerage as Baron Lytton. He was buried in Westminster Abbey.

His Place in Literature. Because his novels have interesting plots and make a striking appeal to the imagination, Bulwer-Lytton won the enthusiastic favor of the public, though not that of the critics, who pronounced his books theatrical, artificial as to style and affected in sentiment. Yet they possess vitality and charm, and are still widely read. Bulwer-Lytton's fiction consists of historic novels, represented by *The Last Days of Pompeii*, *Rienzi*, and *The Last of the Barons*; romances, including the delicately written *The Pilgrims of the Rhine*; and "novels of manners," such as *Pelham*, *Ernest Maltravers*, *The Caxtons*, and *My Novel*. Three of several plays written by him were long popular on the stage. These are *The Lady of Lyons*, *Money*, and *Richelieu*. From the latter we have two well-known quotations:



Photo. Brown Bros

EDWARD BULWER-LYTTON



A NORTH AMERICAN BUNGALOW

A characteristic form, showing in plan the convenient arrangement of living rooms.

The pen is mightier than the sword
and

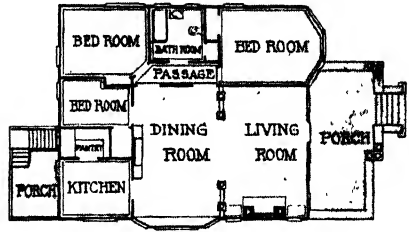
In the lexicon of youth * * * there is no
such word as "fail"

Edward Robert Bulwer-Lytton, second Lord Lytton and first Earl of Lytton (1831-1897), son of the foregoing, attained distinction as a diplomat, politician, and poet. Notwithstanding the activities of a brilliant political career, Lord Lytton, under the pen name of *Owen Meredith*, produced much poetry and prose of a high order.

Principal among his works are the ever-popular *Lucile*; *Orval*, or *The Fool of Time*, the only representation in English of the great Polish poetical school; *Clytemnestra and Other Poems*; *Tannhauser*; and *The Life and Letters of Edward Bulwer, Lord Lytton*.

BUMBLEBEE. See subtitle, in article **BEE**.
BUNDESRAT, *boon' des rait*, a German word meaning *council of the confederation*, applied to the Federal council which assisted the Reichstag, or Parliament, of the German Empire in its legislative functions. See **GERMANY** (Government).

BUNGALOW, *bung' ga loh*, a type of house or residence now very popular in the United States and Canada, and to some extent in Europe. The rooms are conveniently arranged on one floor, though attic rooms are often finished off. Simple of construction, of wood, stone, or brick, yet affording opportunities for



without the house may add considerably to the investment.

The bungalow originated in India, where, besides those owned privately, there are military bungalows built by the government for the use of travelers along the main highway. They are constructed of wood, bamboo, or similar materials. Those of the Europeans are generally built of sun-dried bricks, and have thatched or tiled roofs.

BUNION, *bun' yun*, an affection of the bones and joints of the ball of the foot. It is accompanied by inflammation of the soft parts and distortion of the foot. The basic change is in the spreading of the foot across the ball. This causes the bones in the joints in that region to meet at angles, and the toes to be thrown out of line. Sesamoids, or bony spurs, are generally found between the bones in this region. Rubbing by shoes causes the heads of the bones to enlarge. Thickenings similar to large corns form in the skin and soft parts over the enlarged bones and the inflamed joints.

In the cure of bunions, wearing long, broad shoes plays a part, just as wearing narrow, short shoes plays a part in causing them. Straightening the toes by use of toe holders and toe pads is of some help in effecting a cure. Many cases require operation. X-ray examination assists in the diagnosis. W.A.E.

BUNKER HILL, BATTLE OF. See **REVOLUTIONARY WAR**.

BUNNY, popular name of the rabbit (which see).

BUNSEN BURNER AND BATTERY. The Bunsen burner is a form of gas burner especially adapted for heating. It consists of a tube, in which, by means of holes in the side, the gas becomes mixed with air before burning, so that it produces a smokeless flame which gives no light but produces intense heat. It is widely used in laboratories, and sometimes in soldering.

The Bunsen battery is a form of Voltaic battery, the cell of which consists of a glass cup in which is placed a cylinder of zinc open on one side. Within this is a porous earthen cup containing a rod, or prism, of carbon. The



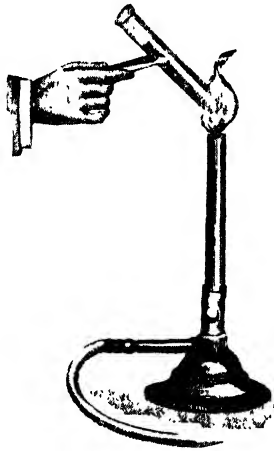
TYPES IN INDIA

At left, the native bungalow; at right, that of a higher class native or of a white family.

rustic and artistic effects in material, roofing, and shape, the bungalow, in the minds of many people, makes the ideal home. But in cities the bungalow is frequently more expensive than a two-story dwelling, because the larger lot necessary to provide sufficient space within and

glass cup is filled with weak sulphuric acid, and the earthen cup, with nitric acid. The electric current is developed by the action of the acids on the zinc. The Bunsen battery works quickly, but it is now little used because more convenient batteries have been invented. See **ELECTRIC BATTERY**.

Robert Wilhelm Eberhard Bunsen (1811-1899), the inventor of the devices described above, was also one of the discoverers of spectrum analysis. He was an eminent German chemist, and for thirty-seven years was professor of chemistry in the University of Heidelberg. See **SPECTRUM ANALYSIS**



BUNSEN BURNER

Showing, by the hand and test-tube, how it is commonly used.

BUNTING, the name applied to various seed-eating birds of the finch family. The *snow bunting*, or *snowbird*, is one of the birds that breed in the Arctic regions of Canada. During winter, flocks of snowbirds are sometimes seen in Southern Canada, and in the United States as far south as Georgia and Kansas. Another well-known species is the *indigo bunting* of Southern Canada and the United States. The *lark bunting*, or *white-winged bunting*, is a common and conspicuous bird in the prairie states and provinces, from Alberta and Western Minnesota to Kansas and Colorado. Like the European skylark, the bird sings on the wing, uttering a spirited, bubbling song, somewhat suggestive of the song of the bobolink. In the United States, the *cowbird*, or *cow blackbird*, is frequently called the *cow bunting*. The *black-throated bunting* is popularly called *dickcissel*. Many buntings are beautifully colored; the most beautiful of all is the *painted bunting* of the Southern United States.

D.L.

Related Subjects. For descriptions of various buntings and other related topics, see the following articles:

Bird	Dickcissel	Indigo Bird
Cowbird	Finch	Snow Bunting

BUNYAN, JOHN (1628-1688), the author of the most famous, and one of the greatest, allegories ever written—*The Pilgrim's Progress*. This remarkable book has been translated into seventy-five languages and dialects—more than any other book except the Bible; and has been read with eager interest in every part of the world (see subhead below).

Bunyan's Life. The son of a poor tinker, Bunyan was born at Elstow, near Bedford, in England, and after a very brief period spent in school, became an humble assistant to his father. At the age of sixteen, however, he ran away from home and joined the Parliamentary army in the civil war against Charles I. He was a boy of intense nature and strong passions, and the spirit of the age turned much of his intensity toward religious questions. The fiery preaching of the Puritans terrified him, and all his reckless living and profanity could not deaden his conscience. At last, mainly through the efforts of his wife, he determined to change his manner of life, and after a spiritual struggle which lasted for years, peace came to him. With characteristic zeal, he threw himself into Christian work, and as a preacher in the Baptist Church he awakened others to all the fears which had been his in his early days.

But dissenters were not allowed to hold public meetings, and for his violation of this law, Bunyan was arrested and placed in Bedford jail. For twelve years he remained there, supporting his family by making shoe laces; and in the intervals of his employment, he wrote the work for which he is famous. After his release in 1672, he was allowed to preach when and where he chose, and the closing years of his life seem to have been very happy. In August, 1688, he rode through a hard storm to reconcile a father and son who had had a violent quarrel, and the exposure brought about his death. A statue was erected in his honor in Bedford almost two centuries after his death, but his chief monuments are his books.

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The Pilgrim's Progress. Briefly stated, this is the story of the spiritual life of man, the account of Christian's journey through the world and his final triumph in the Celestial City. Religious books which mirror forth truthfully the struggle of the soul were written before, and have been written since; why, then, should this one, the work of an uneducated tinker, have taken such a hold on the affections of people everywhere?

The Pilgrim's Progress is not merely a religious dissertation; it is a vivid, dramatic story, with an allegory so plain that it never perplexes or retards the reader who is anxious to know what happens next. For Bunyan did not content himself with simply stating that his hero passed through periods of despond-



Photo—Brown Bros.

JOHN BUNYAN

Undaunted by environment, he wrote one of the world's greatest books while imprisoned for preaching in public.



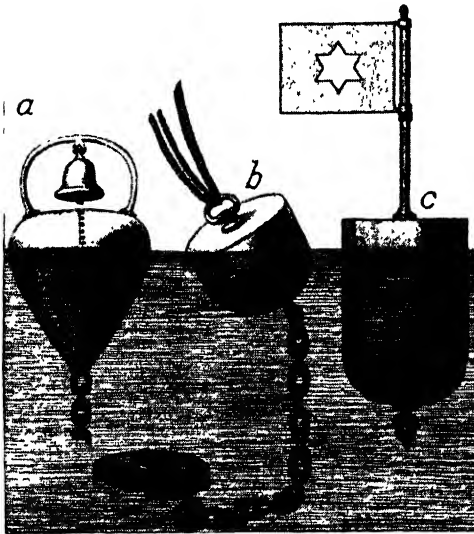
From drawing by Louis Rhead

Christian Encounters the Rogues. The text of *Pilgrim's Progress* states that "There happened, at that time, to come down that Lane from Broad-way-gate three Sturdy Rogues, and their names were Faint-heart, Mistrust, and Guilt."

ency and doubt; he showed him wallowing in the Slough of Despond and shut up in Doubting Castle by the Giant Despair. Lions and "foul fiends" move through the pages, which are yet so enlivened by humor, kindliness, and simple, natural touches that every reader can recognize in the trials of Christian a lifelike picture of his own existence.

Other Works. These include, besides *The Pilgrim's Progress*, *The Life and Death of Mr. Badman*, *The Holy War*, and *Grace Abounding*. The last named has been called his spiritual biography.

BUOY, *boi*, or *boo'y*, an anchored float designed to aid navigation by indicating the location of shoals and the courses of channels



BUOYS

(a) Bell buoy; (b) can buoy; (c) buoy carrying special signal flag.

in harbors or rivers. All ships carry charts which show navigators where to expect buoys, and what facts to learn from them. Thus, if a captain entering a harbor in the United States or Canada sees a red buoy on one side and on the other side a black, he knows he must keep the red on his starboard side. He knows, too, that horizontal red and black stripes mark danger spots, and green buoys, especially dangerous places; vertical black and white stripes indicate the deepest part of the channel, and white buoys show the limits of safe anchorage.

Among the various types of buoy are the *bell buoy*, which clangs dolefully as it is tossed about; the *whistle buoy*, whose motive power is air compressed by the waves; the *lantern buoy*, a little floating lighthouse; the *spar buoy*, a wooden pole which is weighted so that it stands upright; the *can buoy*, an iron cylinder with a dome-shaped base; and the *nun*, or *nul*, buoy, round and tapering at both ends.

Light buoys which burn continuously for months at a time, and operate by automatic mechanism, are among the most remarkable of these aids to navigation (see **LIGHTHOUSE**).

BUOYANCY, *boi' an sie*. See **AIR**, subhead.

BURBANK, LUTHER (1849-1926). In reviewing the life work of this great American horticulturist, one recalls the words written by Jonathan Swift two centuries ago:

And he gave it as his opinion that whoever could make two ears of corn, or two blades of grass, to grow upon a spot where only one grew before, would deserve better of mankind, and do more essential service to his country than the whole race of politicians put together.

Burbank is one of the few men who have devoted their lives to the work of creating new timber trees, fruits, flowers, vegetables, grains, and grasses, and to the work of improving many familiar species.

In the little town of Lancaster, Mass., where he was born and educated, he learned his first lessons in natural history, for from his early boyhood days he was happiest when studying the trees, birds, and flowers. He was unable to go further in school than the town academy, and when yet a young man, he worked in a factory in Worcester, but found his true vocation when he became a market gardener and raiser of seeds. It came to him with special force, as he busied himself with the cultivation of his vegetable garden, that only one of his potato plants bore a seed ball, and it seemed reasonable to him that the offspring of this particular plant ought to show an even greater divergence from the general type. Working out this idea, he produced the famous Burbank potato, of which hundreds of millions of bushels have since been raised.

To find a larger and more favorable field for his labors, Burbank went to California, and in the year 1875 he settled in a valley about fifty miles north of San Francisco. After a disheartening struggle, he finally saved enough money to buy a small tract of land, whereupon he started a nursery of his own, becoming in a few years the owner of a business that netted him \$10,000 a year. It was not material prosperity, however, for which he was working, but an ideal which had been upper-



Photo P & A

LUTHER BURBANK

most in his thoughts for many years—the creation of new species of plants. In 1893, therefore, he sold his nursery and began his career of experimentation and achievement.

At Santa Rosa, Burbank lived in a beautiful home surrounded by rare trees, shrubs, and flowers; he established his great experiment farm at Sebastopol, eight miles distant.

General Methods. Burbank achieved results by carrying on two general lines of work—*crossing* and *selection*. The former process is the uniting of two plants to produce a third, and he brought about this union by placing the pollen of one plant upon the stigma of another, leaving to natural forces the marvel of fertilization (see CROSS-POLLINATION). The pollen was collected just before it was ready to fall, and was applied at once to the blossom of another species.

Selection means the choosing of the best plants and the rejecting of the unfit, or those below certain standards. Thousands of plants were generally grown in the effort to produce one improved species, and all of these had to be examined with painstaking care. Sometimes but one specimen out of several hundred thousand was approved.

Important Achievements. It is impossible to give a condensed description of all the very numerous Burbank creations, but a few of special interest should be mentioned. He originated several varieties of berries of commercial value. The offspring of the native California dewberry and Siberian raspberry, which he called the *Primus* berry, was the "first-known recorded fixed species directly created by man." The *Phenomenal* berry, characterized by its enormous size, is the result of crossing the California wild dewberry and the Cuthbert raspberry; the color of this fruit is light crimson. Of greater interest is the *white blackberry*, a berry of snow-white color and so nearly transparent that its small seeds can be seen.

Burbank's experiments with plums and prunes revolutionized this industry in California. One of his most interesting creations is the *plumcot*, the offspring of a Japanese plum and the apricot. The plumcot is delicious in flavor, and the flesh of each fruit is peculiar in color, being yellow, pink, white, or crimson. He also produced a plum which tastes like the Bartlett pear. Among other new fruits is the *potato*, produced by selection alone from the fruit of the potato. This curious fruit grows upon the potato vine, but in size and general shape, it resembles a small tomato.

Equally marvelous are the Burbank flower creations. Lilies, roses, petunias, dahlias, poppies, and many other beautiful flowers responded freely to his efforts to create new varieties, but probably none has attracted more general interest than his great *Shasta*

daisy, named for his favorite snow-capped peak of the Sierras. The Shasta daisy is the offspring of the English daisy, the wild American daisy, and their pure white Japanese cousin. This lovely flower, with its brilliant white petals and golden center, grows from four to six inches in diameter. (A comparison of this flower and the ordinary daisy appears under the title DAISY.) Timber and forest tree culture, too, engaged his attention. His efforts to produce an edible cactus free from thorns are well known; the spineless cactus is fully described in these volumes, under the heading CACTUS.

B.M.W.

BURDETTE, *bur del'*, ROBERT JONES (1844-1914), an American clergyman and humorist, who became famous originally through his paragraphs contributed to the Burlington (Iowa) *Hawkeye*. He was born in Greensboro, Pa., and attended public school at Peoria, Ill. In 1862 he joined the Forty-seventh Illinois Volunteers, serving through the War of Secession. After the war he wrote for several papers, and finally became associate editor of the *Hawkeye*, from which he was soon quoted in other newspapers throughout the land. He began to lecture in 1877, and ten years later became a licensed preacher in the Baptist Church.

Among his books are the famous *Rise and Fall of the Mustache* and *Other Hawkeyetems*, and *Chimes from a Jester's Bells*.

BURDOCK, a coarse, hairy weed with large heart-shaped leaves and hooked flowers that stick to the clothing of passers-by or to the hair of animals. It is particularly troublesome in the United States and Canada, wherever cows or sheep are pastured. The burdock is also known as *cocklebutton*, *beggar's button*, *burr-bur*, and *stick button*. The plant grows from a biennial root (see BIENNIAL), and the second season the stalk reaches a height of four to nine feet. To eradicate burdock, it is necessary to grub up the roots before seed has formed. There is a demand, however, for burdock seed, leaves, and root for medical purposes. The root and seed are specially pre-



BURDOCK

pared, and used for blood and skin diseases by some people, though physicians now advise against using anything of this kind for diseases of the blood or skin. The leaves of the plant are used as a cooling poultice for swellings, burns, etc. In California, burdock root is employed by the Japanese in making soup. B.M.D.

Scientific Name. The burdock belongs to the composite family, *Compositae*. Its botanical name is *Arctium lappa*.

BUREAU, bu' ro, a division in a department of government, as the Bureau of Animal Industry, in the United States Department of Agriculture. In Canada bureaus are called *branches*, as for example, the Parks Branch of the Department of the Interior.

Bureaucracy means governmental control exercised largely by bureau officials or other really subordinate officers. The term is generally used as suggesting unwarranted official control.

BUREAU OF EDUCATION, since 1920 Office of Education. See page 2127.

BURGENLAND, boor' gen lahnt, a province of Hungary in the Austro-Hungarian Monarchy before 1918; it was ceded to the present Austria. See AUSTRIA.

BURGESSES, bur' jes es, HOUSE OF, the first legislative body ever assembled in America. It was in the colony of Virginia, in the year 1619, that the call was issued for this assembly, and two burgesses, or citizens, from each plantation met the governor and his council in the church at Jamestown. In all, there were twenty-seven men present. They enacted a number of needed laws, but the influence of the first session determined the colonists to continue its work, and the assembling of the burgesses became an annual affair. James I tried to suppress this movement toward representative government in the colonies, but Charles I sanctioned it in order to gain trade concessions. See VIRGINIA (History).

Throughout all the stirring times preceding the Revolutionary War, the house of burgesses, though remaining loyal to England, stood firm for the liberties of the colonies. It was in that assembly in March, 1775, that Patrick Henry delivered his stirring speech which electrified the colonies and strengthened their patriotic impulses; this speech is best remembered for the memorable words:

Is life so dear or peace so sweet as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take, but as for me, give me liberty, or give me death!

[An illustration of the House of Burgesses, showing Patrick Henry addressing the members on the occasion referred to, appears in the article HENRY, PATRICK.]

BURGLARY, bur' gla rie. In criminal law, burglary is defined as "the breaking and entering by night into the dwelling house of another, with intent to commit a felony." En-

tering into a house or building through an open doorway with intent to steal does not constitute burglary, but is classed as robbery or larceny. "Breaking" must occur to place the felony in the criminal division of burglary. What constitutes breaking is open to various constructions, but it is usually held that such breaking need not be accompanied by violence. The opening of a window by sliding the catch without damage to glass or framework is sufficient "breaking" to come within the meaning of the law. The usual punishment for burglary is imprisonment for a term not exceeding twenty years. The killing of a burglar in self-defense, or in defense of family or property, is not a crime, but the one who thus kills must be legally absolved before he can be given his freedom.

Related Subjects. The reader is referred in these volumes to the following articles:

Felony
Larceny

Manslaughter
Robbery

BURGMASSTER, OR BURGERMEISTER, bur' gur my stur, the title of the chief magistrate of a city or large town in Germany and the Netherlands. The burgomaster is practically the same officer as the English and American *mayor*, French *maire*, and Scottish *provost*. He is a salaried official. To obtain the position one must have had some legal training; he must possess a thorough grasp of economic science, and possess good business ability, practical sense, and a fairly broad general knowledge.

He is elected by the municipal body, but in most parts of Germany the government reserves the right to accept or reject the people's choice. A study of the preparation and career of the burgomaster explains why German cities are so well governed, and carries a lesson which American municipalities have not yet heeded. However, a movement in the direction of greater efficiency in American civil administration is seen in the employment of city managers (see CITY MANAGER).

BURGOYNE, bur goin', JOHN (1722-1702), known to fame as an English general of the Revolutionary War, but also as a writer of dramas that were popular in his day. After serving in the British Army in various parts of the world, in 1777 he was appointed commander of an army against the Americans. His taking of Ticonderoga was considered a tragedy by Americans, but his later defeats overbalanced this victory. A part of his army fought a battle at Hubbardton, a detachment of his Hessians was defeated at Bennington, Vt., and on October 17 Burgoyne himself, after a furious battle, was forced to surrender with his whole army at Saratoga, which event proved the turning point of the war. So important were the effects of this conflict that it has been termed one of the "fifteen decisive

battles." Burgoyne was coldly received on his return to England, and was deprived of his command, but upon a change of Ministry he



Photo Brown Bros.

GEN. JOHN BURGoyNE

was appointed commander in chief in Ireland. See REVOLUTIONARY WAR IN AMERICA; FIFTEEN DECISIVE BATTLES.

BUR GRASS. See SAND BUR.

BURGUNDY, *bur'gun die*, a name which in medieval and early modern times denoted a varying territory, first a kingdom, then a duchy, and finally a province of France which became famous for its red wines. The Burgun-

dians, from whom the name was taken, were a Germanic people who early in the fifth century crossed into Gaul and set up a kingdom there. A century later, they were conquered by the Franks, but the Frankish Burgundy was not quite the same in area as the original kingdom. The Treaty of Verdun in 843 split the territory, and by the close of the ninth century there were two Burgundies existing side by side.

In 937 these united to form the kingdom of Arles, but a small portion in the northwest remained independent, and took the name of the Duchy of Burgundy. France gradually acquired a hold on this territory, which was



BURGUNDY

Limits of the province at time of its greatest extent, about 1477.

governed until 1361 by members of the royal House of Capet. In 1363, the Capetian line having died out, Philip the Bold was made Duke of Burgundy, and under his descendants the power of the duchy increased steadily. In 1477 Duke Charles the Bold was killed in battle against the Swiss, and all his territory except the original duchy passed with his daughter's marriage into the control of the House of Hapsburg. Burgundy proper was seized by Louis XI and annexed to France. This old Burgundy forms the present departments of Côte-d'Or, Saône-et-Loire, Yonne, part of Ain, and part of Aube, in the French republic.

BURIAL, a method of disposing of the dead by placing their bodies in caskets below the surface of the ground. Different peoples adopt different methods of disposal, but all are accompanied by some ceremony. Some savage races expose bodies to animals or birds of prey.



Photo, Visual Education Service

INDIAN BURIAL CUSTOM

Method of burial employed in an early day by certain of the Plains Indians in the Western United States

The Egyptians embalmed the bodies of their dead, and preserved them in costly tombs. However, the two most common methods have been placing the dead in the ground, or burning them, the latter known as cremation. Both forms were practiced among the Greeks and Romans, though cremation came to be almost the sole method during the latter



Photo, Visual Education Service

A TOWER OF SILENCE

One of the more decorative of the gruesome burial places of the Parsees, in India (see TOWERS OF SILENCE, for illustration of a less elaborate and possibly more typical structure).

years of the Roman republic. In India the custom still prevails of burning dead bodies and throwing the remains into the Ganges.

The methods of burying have varied. In some cases, as with the early Babylonians, the bodies were placed on the surface of the ground and mounds were raised over them. The dead

were buried in their garments, and their ornaments, weapons, and utensils were placed with them. Roman burial ceremonies were extravagantly splendid and long drawn out. The earliest Egyptians placed their dead in tombs, surrounded by articles of the toilet, food, and drink, showing their belief in a material after-life. The pyramids of the deserts are tombs of the dead.

Among civilized nations of to-day, cemeteries are set apart in which are buried the clothed bodies, in wooden, cement, or metal boxes, after embalming. After the introduction of the Christian religion, the practice of cremation almost entirely disappeared, because of the belief in the resurrection of the body. It has been revived, however, for it is considered by many to be a more sanitary method.

Derivation. The word *burial* is derived from the Anglo-Saxon *byrgels*, meaning *tomb*, from the Old English *byrgan*, meaning *to bury*, and is related to the German *bergen*, which means *to hide*, or *conceal*.

Related Subjects. The following articles deal in part with methods of disposing of the dead, in part with other phases of the subject. But all are of interest in this connection.

Arlington Cemetery
Catacombs
Coffin
Cremation
Embalming
Epitaph
Mausoleum

Mummy
Pyramids
Sarcophagus
Taj Mahal
Tomb
Towers of Silence
Westminster Abbey

BURKE, *burk*, EDMUND (1729-1797). Every American high-school student knows this great English political writer through his speech *On Conciliation with America*, by which he sought in vain to induce the British government to adopt a conciliatory policy toward its colonies.

Burke was born in Dublin, Ireland, and was destined by his lawyer father for the same profession, but he found literature far more to his liking. In London, whither he had gone to study law, he won recognition and several minor political offices by the publication of his *Vindication of Natural Society and Origin of Our Ideas of the Sublime and Beautiful*, and finally, in 1766, he was elected to Parliament. It was a stirring time in that body, and Burke at once took his place as a foremost figure in all its deliberations—a position he held for thirty years. Authorities do not hesitate to declare him the most influ-

ential orator the House of Commons has ever known, and his wonderful powers were always employed on the side of justice.

His great speech *On Conciliation with America* was delivered in 1775, when he was at the summit of his influence, and might seem to indicate that he was a Liberal, but this was not so. The French Revolution did not have his sympathy, and he firmly resisted attempts at Parliamentary reform; but he was always on the side of movements which were for the betterment of humanity. He opposed the slave trade, and put years of research and labor into his effort to uphold the rights of the people of India as against the greedy officials who oppressed them to enrich themselves. The culmination of this struggle was the impeachment of Warren Hastings (which see), in which Burke took an active part, delivering a powerful speech.

His Writings. These were numerous, and include, in addition to those mentioned above and his published speeches, *Reflections on the Revolution in France* and *Observations on a Pamphlet on the Present State of the Nation*. In all that he wrote, there is a richness of imagery and a wealth of figures which show him to have been a poet in spirit, though the medium through which he expressed himself was prose.

BURKE'S PEERAGE, the name usually applied to a publication entitled *Genealogical and Heraldic Dictionary of the Peerage and Baronetage of the United Kingdom*, first compiled in 1826 by John Burke, an Irish man of letters. It contained the names of all British peers and baronets, in alphabetical order, and was the first work of its kind. The publication, still issued annually, is regarded as the best authority on the genealogy of leading British families.

BURLAP, a strong, naturally coarse, heavy cloth made of jute, flax, hemp, or manila. Its natural color is a lifeless tan, and at one time it was used in a very coarse texture without coloring, merely for packing and for coffee bags. It is still used for those purposes; but it has been discovered that burlap can be made a highly ornamental cloth for decoration in the home. It is now sold in many weaves, coarse and comparatively fine, and dyed in every color. As covering for walls in place of wall paper, as hangings, as cushion tops—used in a large number of ways, embroidered, stenciled, or plain—burlap is now a favorite fabric for interior decoration.

BURLESQUE, *bur lesk'*, a story, poem or theatrical performance which makes a laughing matter of some serious work, by words or actions which are a travesty on the original. Noble thoughts, for instance, are expressed in the most commonplace language; things insignificant are talked of in glowing words, making the thing described seem absurd and ridiculous. And that is why such compositions



Photo—Brown Bros.

EDMUND BURKE

Goldsmith said of him, "He wound himself into his subject like a serpent."

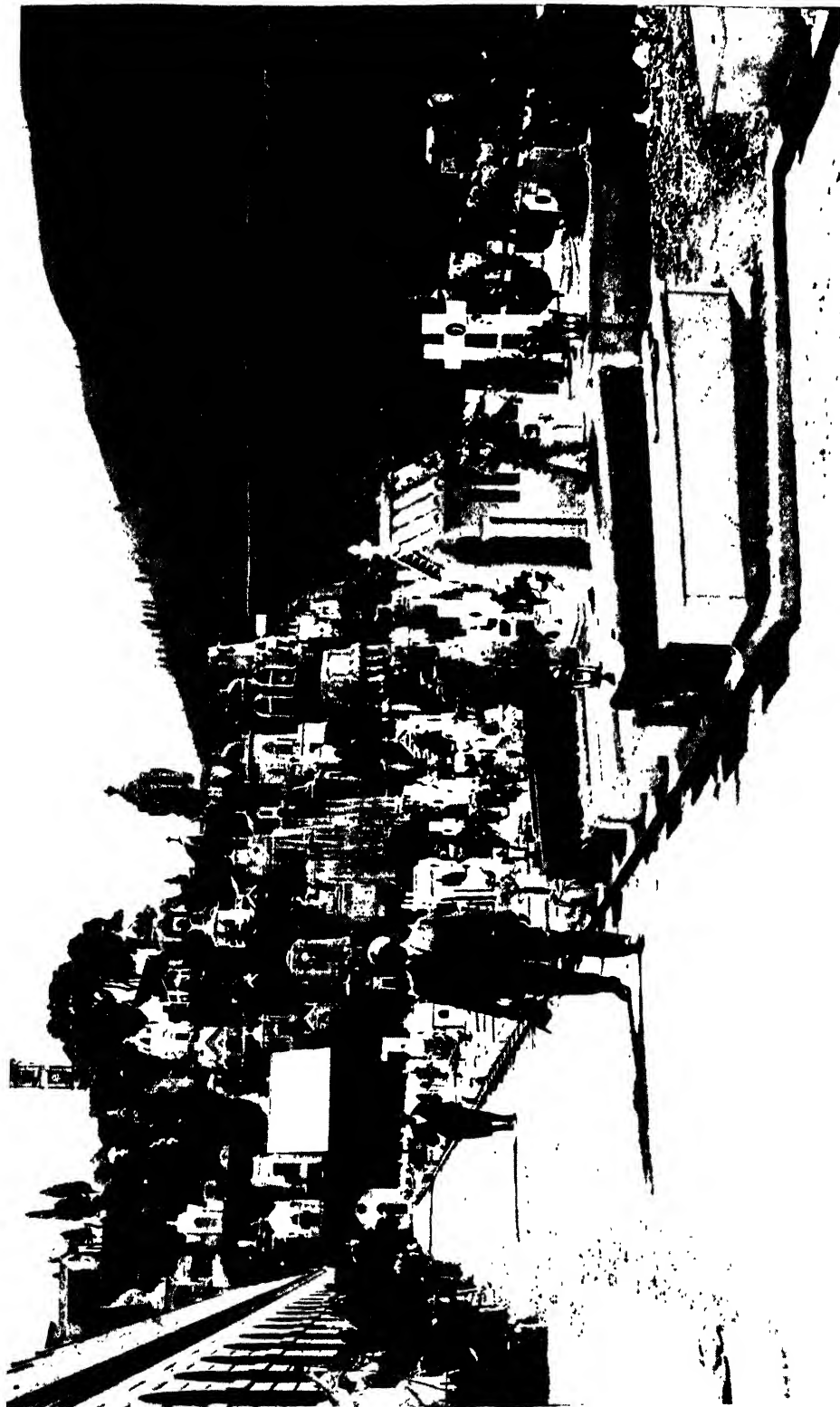


Photo: P & A

The Most Impressive Churchyard in the World. Such is the general verdict respecting this cemetery, located in Genoa, Italy. On the terraced hill, stretching in the background, acre after acre, are masterpieces of finest Italian carving that decorate the graves of notable people

were given the name *burlesque*, the Italian word for raillery, mockery, or jesting.

The most famous of the early English writers of burlesque was Chaucer, who ridiculed some of the long-drawn-out tales of the Middle Ages. *Don Quixote*, by Cervantes, a burlesque on absurdly romantic tales of chivalry, is the most famous example of this class of literary work (see *DON QUIXOTE*). As a form of the drama, burlesque was well known to the Greeks. Molière's comedies are the best-known examples in French literature. Some of the works of Gilbert and Sullivan, particularly *Pinafore* and *The Mikado*, with their burlesque on fads and affectations, are well-known examples. Burlesque plays are not often seen on the modern stage, but short sketches of this character, ridiculing current plays, fads, personages, etc., are popular features of musical comedies and "revues." See *COMEDY*.

BURLINGAME, ANSON (1820-1870), an American statesman and diplomatist, whose most important achievement was his negotia-

tion, in 1868, of a treaty between the United States and China. In this, the latter country for the first time accepted the principles of international law, and really opened its doors to the world.

Burlingame was born in New York state and was educated at the University of Michigan and the Harvard Law School. After practicing law in Boston and serving as state senator, he was elected to the national House of Representatives on the Know-Nothing ticket (see *KNOW-NOTHINGS*). In 1861 President Lincoln appointed Burlingame minister to China, a post which he held until 1867. The following year, while serving as head of an embassy of the Chinese government, he concluded at Washington the epoch-making treaty which is known by his name. See *CHINA* (History).

BURLINGTON, IA. See *IOWA* (back of map).

BURLINGTON, Vt. See *VERMONT* (back of map).



BURMA, *bur' mah*. Lying east of the Bay of Bengal and extending down the western coast of the Malay Peninsula is Burma, the largest and most easterly province of British India. It occupies about 262,700 square miles. On its landward side lie Assam, Tibet, China, and Siam. Though not a part of the peninsula of India, since 1923 it has had a governor responsible to the British authority in India's capital. The country desires colonial status.

To those who read of it, Burma becomes a land of romance, with its "tinkly temple bells," the mist on its rice fields, and its pagodas, "lookin' eastward to the sea"; and it seems not difficult to understand the "ten-year soldier" when he declares that "if you've 'eard the East a-callin', you won't never 'eed naught else." More prosaic writers admit that these pictures, as Kipling gives them in *On the Road to Mandalay*, are not overdrawn.

The People and Their Civilization. Ninety per cent of the 13,000,000 inhabitants of Burma live in the rural districts. The native Burmese,

who are of the Mongolian race, are a good-natured, cheerful people, who take life easily because they live in a land so kind that it is only necessary to "tickle her with a hoe, and she laughs with a harvest." Their philosophy of life, if it may be called by so formal a name, is to work as little as possible and to spend the rest of their time in frolics and festivities. The betel nut and the "whackin' white cheroot" are their chief indulgences (see *BETEL*), although American chewing gum is beginning to displace the betel. Men and women alike dress much in silks and bright colors, and a city street on a festival day is a brilliant sight.

In the hill regions to the east live the Shans, a hard-working people, whose views of life are far more serious than those of the Burmese. They have not the artistic eye for dress that distinguishes the Burmese. The majority of the people are Buddhists, but there are also Hindus, Mohammedans, and Animists. On the whole, they are a progressive people, and the most literate of the entire population of India.



Photos: O R O C

In Far-Away Burma. At top, a study in childhood expressions. Below, a beauty of the higher class. At right, a girl of primitive type, with bamboo rings around her waist and silver ornaments adorning her neck. At bottom, left, the women stop work to be photographed; at right, possibly the strangest fashion in the world, showing a girl who can smile pleasantly when adorned with a necklace of brass coils which weighs twelve pounds.

The Cities. The vast forests and hills of Burma occupy so much of the surface that urban life has little place. Most of the towns are but straggling villages along the rivers. The only cities of importance are the following:

Mandalay, *man' da lay*, a city of peculiar charm, made known to all the world through song and story, lies in the heart of Upper Burma, on the left bank of the Irrawaddy River, 350 miles north of Rangoon, with which it is connected by rail. In 1892 a disastrous fire destroyed nearly the whole of the city, so that now many of the buildings are of modern construction.

The chief features of the city are the gay bazaars, the British cantonment, or military station, the old palace of the kings, built of beautifully carved teakwood, and the numerous monasteries, temples, and pagodas, the most famous being the Aracan Pagoda, containing a brazen image of Buddha twelve feet high. Silk-weaving is the most important industry of this picturesque city of 140,000 inhabitants.

Kipling has immortalized the city in his poem *Mandalay*, the opening stanza of which follows.

By the old Moulmein Pagoda, lookin' eastward to the sea,
There's a Burma girl a-settin', and I know she thinks o' me;
For the wind is in the palm-trees, and the temple bells they say
"Come you back, you British soldier, come you back to Mandalay!"

Rangoon, *rang goon'*, the capital, lies on the Rangoon River, in the delta of the Irrawaddy, twenty-five miles from the Bay of Bengal. The city is the foremost port of Burma, and ranks third among the ports of British India, being surpassed only by Calcutta and Bombay. Teak and rice are the chief exports. There are lumber, oil, and rice mills, and manufacturing of silk and cottons, pottery, and other commodities.

Rangoon is probably the greatest rice market in the world, and its rice mills are as up-to-date as the best in America. The city is fairly modern, and has a free library, a college, a museum, and a hospital. The chief feature of interest, aside from the parks and curious Oriental bazaars, is the famous shrine, sacred to Buddha, which has a pagoda 370 feet high and is the mecca of thousands of pilgrims. Population, 380,000.

The Land and Its Resources. Burma for the most part is a wild, hilly, and densely wooded region, shut off from Tibet on the north by high mountains of the Himalayas, which send their long spurs down through Burma in parallel ranges. In the long valleys between, rivers flow, and these contribute much to the fertility of the soil by the silt which they spread. Chief of these rivers is the Irrawaddy, which is navigable for nine hundred miles and drains three-fourths of the country, ending in a broad and fertile delta plain at its mouth. The eastern districts are drained by a second great river, the Salwin. The division of the province into Upper and Lower Burma has no governmental significance.

Climate. Burma lies approximately in the same latitude as Mexico and Central America,

and thus is almost entirely within the tropics, but the differences in elevation cause decided variations in climate. To the north, in the region of great mountains, are districts where frost is not uncommon, and in the central parts of the country there are conditions typical of temperate regions—hot summers and cool winters. Near the coast and throughout the long, narrow projection that runs southward, there is a tropical sameness of climate, with heavy rainfall, which averages 160 inches a year.

Wild Life. In Burma there are still tracts of land which are clothed with tropical forests. Here grow teakwood, one of the most valuable products of the country; ironwood; palms of all sorts, and the ever-useful bamboo. In and about these jungles range the greatest of game animals, the tiger, the leopard, rhinoceros, deer, crocodile, and most important of all, the elephant. No other part of Asia produces elephants of such great size, and it is from Burma that most of the trained elephants of India are secured. These animals are of the greatest importance to the Burmese, who make of them beasts of burden, training them especially to drag and stack great logs of teakwood.

Minerals. The mineral resources of Burma are believed to be great. Gold is found in the sand and gravel of the river bottoms, and there are valuable deposits of rubies, jade, and sapphires. Silver, tin, and coal mines are developed, but the oil wells are the greatest source of mineral wealth to the country.

Agriculture. Most of the people of Burma make their living from the soil. The moist fertile delta, that of the Irrawaddy, produces immense crops of rice, which forms not only the staple food, but one of the chief commercial products.

The forests are gradually being exploited for timber, rubber, and bamboo pulp for the manufacture of paper.

History. The Burmese claim a long history in the land which they now inhabit, but the early centuries are shrouded in obscurity. From the eleventh century, when its known history began, to the sixteenth, one little kingdom after another made itself powerful and sought to bring the whole territory under its sway. Rich and fertile, the country became of interest to Europeans as early as 1612, and after many disputes and native uprisings, the land fell gradually into the hands of the British, and under their rule has slowly but steadily progressed. Roads and railways have been constructed, and the country's vast commercial possibilities are being developed.

E.D.F.
BURNE-JONES, SIR EDWARD (1833-1898), the greatest of those painters who came under the influence of the Pre-Raphaelite movement

in England (see PRE-RAPHAELITES). He began studying at Oxford for the Church, but, coming under the influence of Rossetti, he and his friend William Morris decided to devote their lives to art. At first his pictures, which show clearly the influence of his master Rossetti, but are better in drawing, were not well received, but while he was still a comparatively young man, he came to be looked upon as one of the most gifted painters England had ever produced. Whether his subjects were from the Bible, as in his *Christ Crucified Upon the Tree of Life*; from medieval legends, as in *Cophetua and the Beggar Maid* and *The Beguiling of Merlin*; or from mythology, as in *Wine of Circe*, *Pan*, and *Psyche*, or the *Pygmalion* series, he introduced into his pictures a romantic atmosphere and a poetic feeling that are intensely appealing to those who appreciate him. He painted both in water color and in oil, and also gained a reputation through his designs for stained glass, mosaics, and other decorative forms. In this field, his influence has been more significant than in painting.

Sir Philip Burne-Jones (1801-1926), son of Sir Edward, also won distinction as a painter, his best-known work being a striking but repellent *l'empire*, based on Kipling's poem of that name. In addition, he also produced excellent portraits of his father, of Watts, and of Kipling.

BURNETT, FRANCES ELIZA HODGSON (1840-1924), an American author who wrote many popular novels and a brilliant story for children, *Little Lord Fauntleroy*, published in 1886. The hero, a beautiful boy with long, fair curls, whose mother kept him dressed in velvet suits, with dainty blouse and wide collar, at once became the most popular child character in fiction. His manner of dress gave a new term to children's clothing, and "Fauntleroy suits" became as popular as the book itself. The story was dramatized, and for years was played throughout the United States and Canada. Later it was the basis of a successful moving picture, with Miss Mary Pickford playing the name part and that of Fauntleroy's mother.

Frances Hodgson was born in Manchester, England, but America claimed her as one of its novelists, for she lived in the United States, with the exception of trips to Europe, after 1865. In 1873 she married Dr. S. M. Burnett, and thereafter used Burnett as a part of her

pen name. She was divorced from Dr. Burnett in 1898, and two years later married Dr. Stephen Townsend, who assisted her in some of her dramatic writing.

Her Literary Career. *Surly Tim's Trouble*, published in *Scribner's Magazine* in 1872, brought Mrs. Burnett to public notice. Five years later she wrote *That Lass o' Lowrie's*, a strong and vivid story of life in the English mining districts; with this book her fame was established. Then followed one novel after another in quick succession. Among the most noteworthy of these are *Haworth's*; *A Lady of Quality*, *A Fair Barbarian*; *Editha's Burglar*; *The Shulite*, *The Dawn of a To-morrow*; *The Secret Garden*; *T. Tembarom*; *Land of the Blue Flower*; *The Head of the House of Coombe*, and *Robin*. Among Mrs. Burnett's books for children, *Sara Crewe* probably ranks next to *Little Lord Fauntleroy* in popularity. A later story, *Rackety-Packety House*, was dramatized and played in New York and Chicago by a cast composed entirely of children. *A Lady of Quality* and *The Dawn of a To-morrow* were also dramatized. Mrs. Burnett's plays, written as such, include the ever-popular *Esmeralda*.

BURNHAM, burn'am, DANIEL HUDSON (1846-1912), an American architect whose name is connected especially with the development of the modern skyscraper and with the movement for beautifying cities. He was born in Henderson, N. Y., and was educated in Chicago and in Massachusetts. Establishing himself in Chicago in 1872, soon after its devastating fire, he aided in the work of reconstruction.

While architect for the World's Columbian Exposition at Chicago, in 1893, he revealed a richness of imagination and an appreciation of beauty that gave his work a world-wide reputation, and he was called upon by various cities to suggest ideas for their improvement. Together with Saint Gaudens and other eminent artists, he laid the plans for a more imposing national capital, the artistic Union Station there being entirely his creation.

Among the Chicago buildings which Burnham designed are the Capitol Building (the Old Masonic Temple), the Railway Exchange, and the Field department store. The famous Flatiron building, New York City, and the handsome Selfridge department store in London, are also products of his genius. The "Chicago Plan," now being carried out, and destined in time to make that city one of the finest in the world, was one of his last works.

BURNHAM, SHERBURNE WESLEY (1838-1921), an American astronomer, whose accomplishments in discovering and cataloging double stars exceeded those of any other observer of his generation. He was born at Thetford, Vt., and educated in the local academy. He began the study of astronomy while a stenographer, and after his appointment as clerk of the United States circuit court for the northern district of Illinois, he spent his spare time in studying the heavens, and became an amateur astronomer of remarkable



FRANCES HODGSON
BURNETT

ability. In 1876 he became connected with the Chicago Observatory. From this position he went to the Lick Observatory, California, and on the opening of the Yerkes Observatory in Wisconsin by the University of Chicago, he was appointed professor of practical astronomy in that institution.

His Work. He published a catalog of stars discovered by him from the founding of the Yerkes Observatory to 1900, also a general catalog of all known double stars visible in the northern hemisphere, in 1907, and *Measures of Proper-Motion Stars*, in 1912.

BURNING GLASS. See SYRACUSE (Sicily); LENS.

BURNS. See BURNS AND SCALDS; FIRST AID TO THE INJURED.

BURNS, JOHN (1858-), the first laboring man and the first Socialist to hold a seat in the British Cabinet. Nothing better expressed the keynote of his character than the statement he once made about himself: "Came into the world struggling, struggling now, and prospects of continuing." From a place as an unknown ten-year old boy, working for a shilling or two a week in a candle factory, to the post of a prominent Cabinet minister, entitled to the prefix "Right Honorable" and a salary of £5,000 a year, was a long, toilsome journey.

Burns was right when he said that his life was a struggle. But if he grew up to manhood in comparative poverty, he did not grow up in ignorance. He read much; Robert Owen, Tom Paine, and William Cobbett were his favorite authors. He also read some of the works of John Stuart Mill, whose arguments against socialism were so weak, he said, that they converted him to it.

Burns was working in Hoe's printing-press shops in 1880, when he was elected to the London County Council. In 1892 he was elected to Parliament for Battersea, and was for many years regularly reelected. In the Campbell-Bannerman and Asquith ministries he sat in the Cabinet as President of the Local Government Board. In 1914 he was for a few months President of the Board of Trade, but resigned in August because he was opposed to British participation in the World War. To some extent, his acceptance of a Cabinet position lessened his prestige among the radicals, but he always remained loyal to union labor and to socialism.

BURNS, ROBERT (1759-1796), one of the world's greatest writers of verse, the idolized "Bobbie Burns" whom every Scotchman regards with a deep personal love. Though most of his best poems were written in the Scottish dialect, they belong no more to Scotland than to the world at large, for their tenderness, passion, and sweetness have in them a universal appeal.

Burns was the son of a tenant farmer, and was born on January 25, 1759, at Alloway, in Ayrshire, in a little cottage which has become a Mecca to thousands of pilgrims. His father could give him little, but whenever he could spare him to go to school, he did it gladly, and he encouraged the longings for knowledge which were born in the boy. Most of young Robert's education was gained from reading, to which he earnestly devoted himself. In this way, he learned what the best English poets could teach him, and thus he cultivated the instinct for poetry which was a part of his nature.

At an early age, he had to begin working on the farm, and by the time he was fifteen, he was doing the work of a man. In 1781 he went to Irvine to learn the business of flax-dressing, but the building in which he was working was destroyed by fire, and he was forced to abandon that living. When his father died, Robert took a small farm at Mossgiel with his brother Gilbert, but the venture was not highly successful. Robert, however, had begun by his poems to attract the attention not only of his neighbors but of educated men of the vicinity, and this does not seem strange when it is remembered that *The Cotter's Saturday Night*, *To a Mouse*, and *The Jolly Beggars* were produced at that time.

An unhappy and unsuccessful love affair with Jean Armour of Mossgiel decided him to emigrate to Jamaica, and to obtain money for his passage, he published by subscription, in 1786, a volume of his poems.

This volume gained the approval of eminent men in Edinburgh, and at their suggestion he gave up his voyage and went to the city to make arrangements for publishing a new edition. The books sold far better than he had dared to hope, and the young man, admired and flattered, was received in the highest society. Scott, then a boy of fifteen, saw him and was deeply impressed. "I never saw," he wrote years later, "such another eye in a human head, though I have seen the most distinguished men in my time."

Returning to the country with about \$2,500 which the sale of his books had brought him, Burns took a farm at Ellisland, near Dumfries, and in 1788 he married Jean Armour. It was during his residence on this farm that he wrote, in a single day, *Tam O'Shanter*. Again, farming was not successful, and Burns accepted the post of exciseman, performing his duties conscientiously. The spectacle of Scotland's greatest poet testing ale and collecting duties on it is a strange one to people of to-day, but those of his own time appear to have seen nothing unusual in it.

In 1791, completely discouraged with farming, Burns moved to Dumfries, and relied entirely on his salary as exciseman. He continued



Photos: U & U; Frith & Co.

The Idolized "Bobbie Burns." In the inset, a portrait of "the poet of homely human nature, not half so homely or prosaic as it seems." Burns Memorial at Alloway, Scotland. The Burns cottage at Alloway, birthplace of this son of a tenant farmer

to write, increasing his local fame by a number of beautiful songs adapted to old Scottish tunes. But the life in Dumfries was of the wrong sort for a man possessed of as little self-control as was Burns. The idle and the dissipated gathered around him, for his brilliant wit gave a charm to their meetings; while the more respectable classes refused to admit him to their society because of these low associations and his own increasingly dissipated habits. In the winter of 1795, his health began to decline, and in the following summer he died. His wife and four children were made comfortable by the proceeds from a subscription edition of his poems which his friends and admirers at once brought out.

Burns was one of the most human of all the world's great writers—the things which interested and moved him interest and move every man who keeps himself open to impressions. Honest, proud, friendly, and warm-hearted, with a sound understanding and vigorous imagination, he combined with these qualities the high passions which were his ruin. Burns himself felt that justice had never been done him, but he owed the unhappiness and failure of his life fully as much to his own lack of self-control as to outward circumstances. And yet, the epigram that "it was Burns' virtues that killed him" has in it much of truth, for his understanding and his better judgment were at war continually with his passions, and the struggle wore out even his strong body.

As to his poetry, there is but one verdict—of its kind it is unsurpassed. The charm of the simple peasant home, the pathos of the daisy cut from its stem, or the field mouse despoiled of its nest—these he not only felt to the full, but he was able to make others feel. And his love songs, such as *My Luv's Like a Red, Red Rose*; *Highland Mary*; *Bonnie Doon*, and *O Wert Thou in the Cauld Blast*, are of the very essence of tenderness, and will endure long after more elaborate songs have perished. Of the lines from his poems which made for themselves a place in the common speech, and will ever be quoted, the following may be noted:

The best laid schemes o' mice and men
Gang aft a-gley.

Man's inhumanity to man
Makes countless thousands mourn.
Oh wad some power the giftie gie us
To see oursel's as others see us!

The rank is but the guinea's stamp,
The man's the gowd for a' that.

BURNS AND SCALDS are harmful and sometimes dangerous injuries. Burns are caused by dry heat; scalds, by steam or other kinds of moist heat. Burns are classed as first, second, or third degree, according to the depth of the burn.

In a first-degree burn, only the epidermis is destroyed. The true skin is not seriously harmed. There is redness and inflammation, but no blister formation. In a second-degree burn, there is blister formation; both the true skin and the epidermis are involved. Third-degree burns include all those in which the structures below, as well as the skin, are involved. The extent of the burn is more important than its depth, so far as danger is concerned. Burns of the first degree are generally fatal, if more than half of the skin is involved. More severe burns are apt to be fatal if lesser areas are involved.

First-Aid Treatment. The first indication is to apply something which will shut out the air and relieve pain. For this purpose, use one of the following methods:

Plunge the burned parts in a pan of water. One teaspoonful of salt added to one quart of water is better than plain water.

Dust the burned area heavily with cooking soda or with flour. Cover with vaseline or with carron oil, provided they are clean and reasonably near sterile. (Carron oil is a mixture of linseed and lime water. It is rich in bacteria, unless it has been sterilized and then kept sterile.)

To overcome shock, give aromatic spirits of ammonia (20 to 60 minims in a glass of water) or warm coffee, or a dose of morphine.

In case of chemical burns, wash the burn with water as quickly as possible, to remove the caustic. If the caustic was an acid, wash the wound with the quickest available alkali. This may be plaster scraped from the wall, or baking soda, or soap.

If it was an alkali, use a dilute acid, such as vinegar, at once. If the caustic was carbolic acid, wash with alcohol, brandy, or whisky.

General Treatment. Stove burns should be cared for by a physician. Popular treatments are those with tannic acid, picric acid, and paraffin. In the tannic-acid treatment, sprinkle tannic acid on the burn daily, until the surface is dry and parchment-like. This happens in one to four days. Then dress with light, open gauze dressing.

The picric-acid treatment consists in applying a one per cent solution on gauze.

In the paraffin treatment, liquid paraffin, warm but not hot, is sprayed over the surface of the burn. This acts as protective covering.

Carbolic-acid applications should be used with great caution, because of the danger of absorption.

Mild first-degree dry burns require no after treatment, except the application of an aseptic dusting and covering with a simple gauze dressing. Scalds are treated like burns. See **FIRST AID TO THE INJURED** (Burns). W.A.E.

BURNSIDE, AMBROSE EVERETT (1824-1881), a Union soldier throughout the War of

Secession. He was graduated from the Military Academy at West Point in 1847, but in 1853 resigned from the army to take up the manufacture of firearms at Bristol, R. I. In 1856 he invented the breech-loading rifle known by his name. When the war began, in 1861, Burnside reentered the army, and as colonel of Rhode Island volunteers took part in the first Battle of Bull Run. In 1862, as commander of the Department of North Carolina, he captured the Confederate garrison on Roanoke Island, and was raised to the rank of major general of volunteers.

He was twice offered the chief command of the Army of Virginia, but declined it. With great loss of life, his force held the stone bridge at Antietam, the important post of that battle, and when, later, General McClellan was relieved, Burnside took command. After the disastrous Battle of Fredericksburg, he was superseded by Hooker, and was transferred to the Department of the Ohio. During 1864 and 1865, he served under Grant, and took part in many important battles.

After the war, Burnside was connected with various railroad enterprises, was governor of Rhode Island from 1866 to 1869, and from 1875 until his death he was a United States Senator.

Origin of the Name of a Beard. His habit of closely shaving his chin and allowing his beard to grow on the sides of his face brought about the use of the term *burnsides*, as applied to sidewhiskers.

BURNSTONE. See SULPHUR.

BURNT OFFERING. See SACRIFICE.

BURPEE, LAWRENCE. See CANADIAN LITERATURE (English Canada).

BURR, AARON (1756-1836), an American statesman whose talents and energy fitted him to rise high in political life. His ambition, however, and his inability to meet opposition serenely, led him into situations which branded him in the popular mind of his time as a murderer and a traitor.

Burr was born at Newark, N. J., and was graduated in 1772 at Princeton College, of which his father, Aaron Burr, and his grandfather, the celebrated Jonathan Edwards, had been presidents. In the Continental army, which he joined in 1775, he gained a reputation for courage and rose to the rank of lieutenant colonel. He resigned from the service in 1778, was admitted to the bar, and practiced in

Albany and then in New York, quickly becoming a leader in his profession. He served in the state legislature, was attorney-general of New York, and in 1791 was elected to the United States Senate. He has been called the "first boss of New York state."

From his entrance into political life, Burr was an opponent and rival of Alexander Hamilton. In 1800 he was a candidate for President of the United States, and received the same number of votes as Jefferson; but the House of Representatives, chiefly through the influence of Hamilton, elected Jefferson, and Burr became Vice-President (see Constitution of the United States, Art. II, Sec. 2). This was a bitter grievance, and when, in 1804, Burr was defeated in the race for the governorship of New York, he attributed that also to Hamilton's influence, probably with good reason. Intensely angry now, he forced a duel upon Hamilton. The two met at Weehawken, N. J., on July 11, 1804, and at the signal, Hamilton fired into the air. Burr, however, took careful aim, and his great rival fell, mortally wounded.

There was a loud outcry, and Burr fled to Georgia, but later returned to Washington and completed his term as Vice-President. His restless ambition, however, would not permit him to contemplate the ruin of all his political hopes, and he therefore prepared to raise a force for an adventure in the Southwest. Perhaps he meant to conquer Texas and establish there a republic, with himself at its head. Apparently he believed that he might be successful in detaching the Western states from the Union and thereby revenge himself for the slights which he had suffered. Several men of wealth and influence, like Harman Blennerhassett (which see), were won over by his promises, and Andrew Jackson received him as a friend. The scheme had not progressed far before it became known to the government. His force scattered in the lower Mississippi, his confederate, Wilkinson, turned against him, and he was arrested and tried for treason. Chief Justice John Marshall, however, directed his acquittal. His reputation was ruined, but after some years spent in Europe, he returned to New York in 1812 and opened a law office. Despite his ability, he never regained a large practice, and was shunned by society. A.B.H.



Photo Brown Bros.
GENERAL BURNSIDE



Photo U & U
AARON BURR

Who might have been President of the United States except for the opposition of one man

Theodosia Burr (1783-1813), his only daughter, was celebrated not only for her beauty and cleverness, but for her unshaken devotion to her father. She was his housekeeper and favorite companion until her marriage in 1801 to Joseph Alston, afterward governor of South Carolina. During her father's trial, she worked constantly to arouse public sympathy for him, and on his return from Europe, she sailed for New York to meet him. Her ship, the *Patriot*, disappeared during the voyage, and no one on board was ever heard from again; whether it was wrecked by a storm or captured by pirates was not known.

BURR-BUR. See BURDOCK.

BURROUGHS, *bur' ohz*, JOHN (1837-1921), one of America's favorite writers on outdoor life, a literary naturalist whose descriptions of birds, bees, and flowers are among the most charming in all literature. He was born at Roxbury, N. Y., and spent his boyhood on his father's farm, working, reading, and studying. The essay was always his favorite form of literature, and he found especial enjoyment in reading Emerson, Walt Whitman, and Matthew Arnold. The first, he said, awakened a religious feeling, the second quickened his interest in human nature; the third taught him to think and write clearly. His first published book, *Wal' Whitman a Poet and Person* (1867), was written while he was a clerk in the Treasury Department at Washington. He left this position in 1873, was for several years a national bank examiner, and then, having bought a fruit farm at West Park, near Esopus, on the Hudson, settled down to the congenial life of farmer, student of nature, and essayist.

Burroughs' essays are read and loved both in the home and in the school, and are enjoyed equally by children and their elders. Few other nature writers have quite his gift for making the beauties of outdoor life a reality to the reader. He had the high art of writing so clearly and simply that one forgets his manner of expression and becomes absorbed in the matter.

Burroughs' Books. His sympathetic interest in his little friends of the woodlands and his amazing powers of observation are happily revealed in the quaint and suggestive titles of his essays, *Bird Enemies*, *The Tragedies of the Nests*, *An Idyl of the Honey-Bee*, *Winter Neighbors*, *A Taste of Maine Birch*, and *Winter Sunshine*. *Whitman, a Study*, and *Literary Values* are representative of his literary essays; *The Light of Day* gives his personal religious views. His experiences on a Western trip with Theodore Roosevelt are interest-

ingly told in *Camping and Tramping with Roosevelt*. He also wrote a number of poems, collected under the title *Bird and Bough*. Among his last books are *The Summit of the Years*, *The Breath of Life*, *Field and Study*, and *Under the Apple Trees*.

BURYING BEETLE, also called **SEXTON BEETLE**, is an insect that has a keen sense of smell, which guides it promptly to small dead animals, such as mice and birds, the basis of its domestic economy. Having found a small carrion, it burrows around and under the body until the animal is about five inches below the surface of the ground. In this carrion the female deposits her eggs, and when the larvae (young) hatch, in about two weeks, they live until mature upon the decaying matter, and then begin to repeat the life history of their parents. The adults are from an inch to an inch and a half long, and have thick, parallel-sided bodies, with red markings.

Classification. The insects that specifically bear the name burying beetle belong to the genus *Necrophorus*, in the family *Silphidae*, order *Coleoptera* (see **BEETLE**).

BUSHEL, the common measure of all bulky articles of commerce, equal to four pecks, or thirty-two quarts. The standard bushel in the United States and Canada contains 2,150.42 cubic inches, being equal in capacity to a cylinder eight inches deep and eighteen and one-half inches in diameter, interior measure. In Great Britain an *imperial bushel* is used; it has a capacity of 2,218.192 cubic inches. See **DENOMINATE NUMBERS**.

BUSHMEN, a tribe of African dwarfs, averaging below five feet in stature, who inhabit the plains in the northern part of the Cape of Good Hope province. They are a

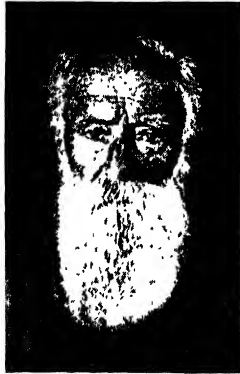


Photo U & U

JOHN BURROUGHS



HOW THE BUSHMEN LIVE
A native village in the "Bush."

fierce, unsociable people, leading a wandering life and living by hunting. It is believed that they represent the aboriginal element in the population of South Africa. Cultivation of the land has never appealed to them. Their skin is a dirty, yellowish-white, and their language is harsh and guttural, with many curious clicking sounds somewhat similar to those in the Hottentot language. They still use poisoned

weapons on occasion, which make them feared by the neighboring tribes.

In recent years, these little people have shown an inclination to accept a few of the advantages of civilization. Little is known about their social affairs, except that each family apparently constitutes a community unto itself. They are nominally subject to the laws of the Union of South Africa, but are left to their own devices as long as they do not indulge in robbery.

C.W.

BUSHNELL, DAVID, designer of the first submarine to be used in war. See **SUBMARINE**.

BUSH TITS. See **TITMOUSE**.

BUSINESS COLLEGE, a school for the training of persons for commercial positions such as those of clerk, bookkeeper, or stenographer. The first business instruction of any kind, so far as known, was given by R. M. Bartlett of Philadelphia, who, in 1846, began to give instruction to a few private pupils in book-keeping and other commercial subjects. The business college was the outgrowth of his work, and by 1860 all the leading cities of the United States had one or more of these schools.

The growth of commerce and manufactures and the extension of railways, steamship lines, the telegraph, and the telephone not only increased the volume of business, but also made commercial transactions much more complex than formerly. From these conditions arose a demand for a more extended business training for youth; to meet this demand, the courses of study in business colleges have been extended until now in the best schools they include commercial arithmetic; a thorough system of accounting, including banking and commission; shorthand and typewriting; commercial law; at least one modern language, usually German or Spanish; political economy, and commercial geography. Many high schools provide commercial courses of one to two years. Schools of commerce, with four-year courses of college grade, are maintained in a number of universities, and their number is increasing. Most of the other commercial schools are conducted as private enterprises.

F.H.E.

Related Subjects. The reader is referred in these volumes to the following articles

Accountancy
Bookkeeping

Shorthand
Vocational Education

BUST, in sculpture, a figure representing the upper part of the human body, sometimes only the head and neck, but often including parts of the breast and shoulders. This form of sculpture was practiced by the Greeks as early as the sixth century B. C., and is shown in the *Hermae*, which were heads of the god *Hermes* mounted on pillars and erected along the roads to serve as guideposts. The Greeks did not make portrait busts of their great men to any extent until the time of Alexander the Great, but from that period there has sur-

vived a celebrated series of busts of Alexander and his successors, and also many representations of distinguished poets, philosophers, and orators, including Plato, Zeno, and Demosthenes. Both marble and bronze were used, though the latter was the more common.

During the days of the republic, the Romans filled their public places with portrait busts, and the popularity of this form of sculpture continued until the third century of the Christian Era. In the Capitoline Museum and in the Vatican are famous collections of busts of the emperors, and good examples may also be seen in the British Museum, London, and in the Louvre, in Paris. A magnificent private collection of busts, mostly bronzes, belonging to a philosopher of the time of Cicero, has been unearthed at Herculaneum, and has been placed in the museum at Naples.

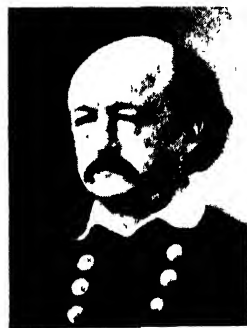
Bust portraiture was a lost art from the sixth to the thirteenth century, but it enjoyed a splendid revival through the Italian sculptors of the Renaissance, and there has been no decline in the art since that time. Jean Antoine Houdon, a French sculptor of the eighteenth century, excelled in this field; at the present time practically every sculptor of note is successful in bust portraiture.

Related Subjects. For illustrations of busts, see articles **CAESAR**; **ALEXANDER THE GREAT**; **HOMER**, etc. See, also, **HOUDON**, **JEAN ANTOINE**.

BUTCHER BIRD. See **SHRIKE**.

BUTLER, BENJAMIN FRANKLIN (1818-1893), an American politician and general, probably of all Northern officers during the War of Secession the one least liked in the South. He was born at Deerfield, N. H., studied at Waterville College, Maine, and having gained admission to the bar, practiced law with great success, particularly in behalf of labor, at Lowell, Mass. Later, in the state legislature, he worked for labor reform. Shortly after the outbreak of the War of Secession, he was made major general of volunteers and placed in command of the Department of Eastern Virginia; and though he showed no great military ability, he came prominently before the public because of his declaration that slaves within the Union lines were "contraband of war" (see **CONTRABAND**).

During his administration of New Orleans in 1862, to which duty he had been assigned, he issued vigorous repressive orders which won him the unsavory nickname of "Beast Butler,"



Photo—Brown Bros.

BENJAMIN F. BUTLER

and caused Jefferson Davis to proclaim him an outlaw, to be hanged if captured. He afterward held commands in Virginia and North Carolina, but General Grant removed him in 1864, and he returned to political life. Elected to Congress as a Republican in 1866, he served until 1870, except for two years, and was especially active in the impeachment proceedings against President Johnson. After striving vainly several times to gain the governorship of Massachusetts, he was elected to that office in 1882 by the Democrats, and two years later was the Greenback-Labor candidate for President.

BUTLER, NICHOLAS MURRAY (1862-), an American educator, born in Elizabeth, N. J., and educated at Columbia College (now Columbia University). After graduation, he took special courses in Berlin and Paris. Following his studies abroad, he was appointed assistant in philosophy at Columbia, and when the institution was reorganized as a university, he became the first dean of the faculty of philosophy. He founded, and was the first president of, the school which became the Teachers College of Columbia University. It was through his influence, while a member of the state board of education of New Jersey, that manual training was introduced into the public schools of that state. Dr. Butler succeeded Seth Low as president of Columbia University in 1902.



Photo. Brown Bros.

NICHOLAS M. BUTLER

He has taken an active interest in politics; in 1912 he was chosen to succeed James S. Sherman as nominee on the Republican ticket for Vice-President of the United States, Mr. Sherman having died just after the Presidential election, but before the meeting of the Electoral College.

On the question of prohibition, Dr. Butler opposed the Eighteenth Amendment and its enacting legislation, the Volstead Act, and was a receptive candidate for President of the United States in 1928.

His Published Works. Dr. Butler is the author of numerous books, among them being *True and False Democracy*, *The American As He Is*, *Philosophy, Why Should We Change Our Form of Government*, *The International Mind*, *The Meaning of Education*, *A World in Ferment*, *Is America Worth Saving*, *Scholarship and Service*, and *Building the American Nation*.

BUTLER, PA. See PENNSYLVANIA (back of map).

BUTLER, SAMUEL (1612-1680), an English writer of the reign of Charles II, now remembered chiefly as the author of *Hudibras*, a poem published in three parts between 1663 and 1678, that held the Puritans up to mockery and ridicule. It became immensely popular among the frequenters of the London coffee-houses and taverns and at the English court, because of its wit, drollery, and sarcastic thrusts at the staid and sober Puritans. *Hudibras*, from *Hugh de Bras*, one of the Knights of King Arthur, is the name of the hero of the poem; Butler found the inspiration for the character in a country gentleman whom he had once served as attendant. Some of the most familiar proverbs of our common speech have their origin in Butler's work, such as "I smell a rat," "Spare the rod and spoil the child," "Look before you leap." The lines which follow illustrate very well the style and form of wit:



Photo. Brown Bros.

SAMUEL BUTLER

He'd undertake to prove, by force
Of argument, a man's no horse
He'd prove a buzzard is no fowl,
And that a Lord may be an owl,
A calf an Alderman, a goose a justice,
And rooks Committee-men or Trustees.

BUTLER COLLEGE. See Indiana (Education).

BUTTE, *bute*, a hill standing alone, or a mountain rising abruptly above the surrounding lower country. In America, buttes abound in the Western mountain region. Many of them have been formed by the erosion of ancient plateaus, and are prominent features in the landscape. The city of Butte, Montana, is so named because of its nearness to elevations of this nature. See PLATEAU. R.H.W.

Derivation. The word *butte* had its origin in a French word meaning *mound, hillock, or elevation*.

BUTTE, *bute*, MONT., the county seat of Silver Bow County, is the largest city in the state and the center of the greatest copper-mining district in the world. It is situated in the southwestern part of the state, on a broad plateau more than 5,700 feet above sea level, between the Bitter Root Mountains on the west and the Rocky Mountains on the east. In this thinly settled state, which is the third largest in the Union, Butte's nearest city neighbors are far distant. Helena, the state capital, is seventy-three miles northeast, and 383 miles

west is Spokane. Salt Lake City is 397 miles southeast, Seattle 672 miles northwest, and Chicago about 1,526 miles southeast. Population, 1930, 39,540.

After the gold rush to California, prospectors combed the hills far and near for rich ores. The Butte district started in 1864 as a placer camp, panning gold from the sands of Silver Bow Creek. A town site was laid out in 1867 and incorporated in 1876. All provisions came to the camp by ox carts until the completion of the Northern Pacific Railroad, in 1883. By 1867 the gold placer operations had been worked out and silver became the most valuable ore. The silver period reached its climax in 1887, and in 1893, following the collapse in the price of silver, its mining practically disappeared as a primary industry. To-day silver and gold production is a by-product of copper and zinc recovery. In 1880 rich copper deposits were found, and the life of the city assured. See MONTANA (Physical Features)

Transportation. The great distances between Butte and its nearest neighbors are minimized by service over four great transcontinental railroad lines, the Northern Pacific, the Great Northern, the Chicago, Milwaukee, St. Paul & Pacific, and the Oregon Short Line, of the Union Pacific system. Connecting with Kansas City and Denver is the Chicago, Burlington & Quincy Railroad. Butte is the terminus of the Butte, Anaconda & Pacific, the first electrified railroad in America.

The National Parks Highway connects Butte with the Glacier National Park to the north, and Yellowstone National Park, to the south, is reached over the Montana-Utah Highway.

Industry. Butte is one of the greatest mining camps on earth. One-sixth of the world's production and one-third of America's output of copper is shipped from Butte. Enormous amounts of zinc, gold, and silver are mined, as well as copper. At Anaconda, twenty-six miles distant, is located the Washoe smelter, the world's greatest reduction works. Besides its vast mining activities, Butte operates extensive planing mills, tile factories, iron-works, and machine shops. Electric power is furnished Butte by the Great Falls of the Missouri River, 130 miles distant, Canyon Ferry, Madison Valley, and Big Hole, and it is used by the railroads, the mines, and the city. As a result, smoke is practically eliminated from the district.

Education. The Montana State School of Mines is located in Butte. The city also claims the largest business college in the Northwest.

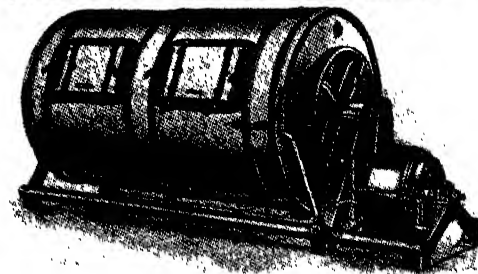
F R V.

BUTTER, an important dairy product made from the fat of milk, known to man for nearly 4,000 years and now one of the most extensively used foods in temperate regions. It has been said that "bread is the staff of life, but bread and butter is a gold-headed cane."

Butter was formerly made from the milk of goats and sheep, but the market product that has so many familiar uses in the modern household is made only from the milk of cows.

Fat occurs in milk in the form of tiny globe-like particles. Formerly, it was supposed that each particle was enclosed in a thin skin, or membrane, but this belief is no longer held by scientists, for several reasons. One of these is that by the violent agitation of hot milk with an egg beater, the fat globules may be divided into smaller ones, and the milk is still normal in appearance. Were each globule surrounded by a membrane, this would not be the case. When milk is shaken about, or churned, the liquid globules are solidified, and the fat particles cling together, forming the compact mass known as butter.

At least twenty centuries before the Christian Era, men made butter by churning milk in skin bags, but in that period it was semi-



HOW YOUTH'S HARDSHIPS ARE DECREASING
Old and new processes of butter-making

liquid in form and was always spoken of as being "poured out." Butter was valued by the ancients as a medicine and as an ointment which they rubbed on the body after bathing, and it was burned in lamps as we now burn oil, but it seems to have been used as food only to a slight extent. Even at the present time, the people of Southern Europe prefer olive oil to butter as food.

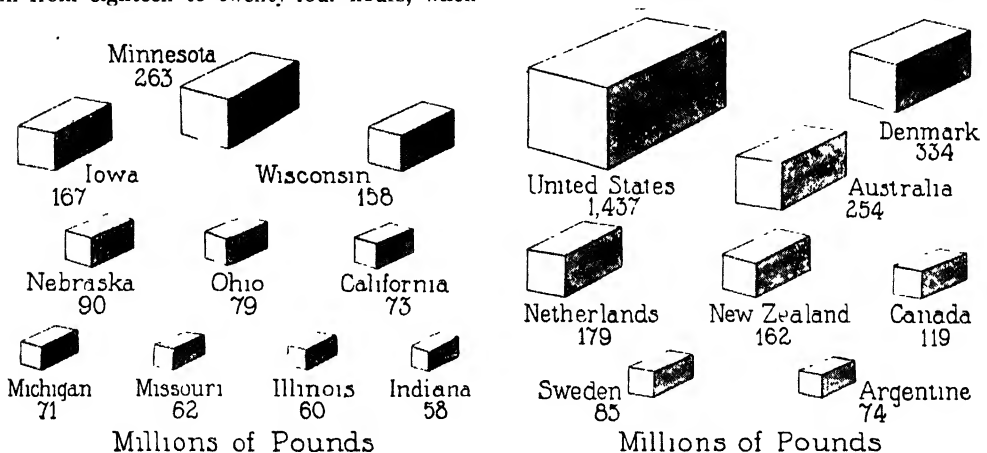
It is said that the Arabs learned by accident how to make butter. They put milk in skin bags, which were carried across the deserts on the backs of camels, and the jolting of their burden during the journey caused the milk to be churned into a butter mass. In India, where on account of the climate it is difficult to keep food sweet for any length of time, the natives make fresh butter every day by shaking milk in bottles.

The Modern Method of Making Butter. The butter made according to these crude methods is, of course, inferior to the product of the modern creamery or dairy farm. The chief processes in butter-making of the present day are creaming, or separating, ripening, churning, and working.

Separating. Though butter may be made from fresh milk, ordinarily only the cream is used. Cream is a thick, oily substance, composed of the globules of fat that rise and gather on the surface of milk. There are two general methods of separating the cream from milk—the gravity and the centrifugal method. The gravity method consists in setting the milk in a cool place in shallow pans, or putting it in deep cans immersed in cold water. The cream, which is lighter than the water and other substances in the milk, rises to the surface in from eighteen to twenty-four hours, when

undesirable germs will develop. Hence, artificial "starters" of soured skim milk or prepared ferments are frequently added to the cream. The use of improved cultures for the purpose of ripening cream has been greatly extended in the United States through the efforts of the dairy schools and the agricultural experiment stations of the various states. After separating, the cream is cooled to at least 50° F., then warmed to 60° to 70°, and is held at this temperature until distinctly sour, or until it contains about five-tenths per cent acidity. It is then cooled to near 50°, and is held at that temperature until churned, usually twelve hours.

This is sour-cream butter. In recent years, the demand for sweet-cream butter has greatly increased, and for making it the cream is ripened to only three-tenths per cent acidity.



PRODUCTION OF CREAMERY BUTTER IN LEADING AMERICAN STATES AND IN LEADING COUNTRIES

The figures, in millions of pounds, represent a three-year average

it is skimmed off the top. If deep cans are used, the skim milk may be drawn off from below.

In creameries and large dairies, the cream separator has come into general use. In this device, the cream is separated from the milk in a bowl or drum which whirls around at the rate of from 5,000 to 8,000 revolutions a minute. Small hand separators skim from 200 to 500 pounds of milk an hour, and the larger machines, 10,000 pounds or more; under favorable conditions, less than 0.1 per cent of fat is left in the skim milk.

Ripening. Cream is usually ripened, or soured, before it is churned; that is, certain germs are allowed to develop in it that help to give the butter the agreeable flavor and aroma that we associate with a good market product. Sometimes the ripening is left to chance, but in this case there is always a danger that

Churning and Working During the churning process, the cream should be kept at a temperature of from 50° to 65° F. As the cream is shaken about, the liquid fat solidifies, and the minute granules of fat unite; these collect as they are brought into contact with each other, and when they reach the size of wheat kernels, the buttermilk is drained off, and the butter is washed.

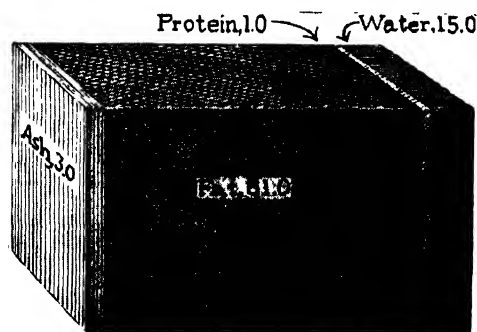
Finally, the butter is "worked," to remove the buttermilk, to incorporate the necessary salt, and to reduce the butter to a compact mass. The amount of salt used is commonly one ounce to the pound, but this depends upon the taste of the consumers. Europeans, as a rule, salt their butter to a less degree than do Americans. After the product is worked, it is made into rectangular prints, or is packed in boxes or tubs for marketing. In domestic butter-making, the churning and working of the

butter are usually done by hand labor, but in creameries these operations are performed by machinery.

The Qualities of Butter. The special qualities which determine the relative excellence of butter are flavor, texture, salt, and color. Some purchasers require a butter that is mild and delicate; others prefer a high flavor, but whatever the flavor, it should be distinctive and clean. Bad flavors are often due to odors of other foods or of decaying substances, these odors being readily absorbed by butter, if it is brought into immediate contact with them. The keeping quality of butter depends upon the care exercised in the making. Butter made from sweet as well as from properly ripened cream, and which is well worked and evenly salted, retains its original quality for a considerable length of time. If the cream is too old and the buttermilk is not fully removed, the butter is liable to become rancid. Scrupulous cleanliness should be the rule throughout the entire process. Butter is said to have a good texture if it is hard and firm and will spread easily, and does not have a greasy, oily feel and taste.

Butter is naturally golden-yellow in color, this quality varying with the feed and the breed of the cows. If made in the spring and early summer, when the cows are feeding upon the fresh new grass of the pastures, it is usually darker than when made at other seasons, and some artificial butter color is commonly added, so that there may be a uniform color throughout the year. Annatto is in general use for the purpose, and turmeric, saffron, marigold leaves, and carrot juice are also occasionally employed.

Composition. Butter varies in composition with the conditions under which it is made, but the following figures represent an average grade: fat, about 81 per cent, water, 15 per

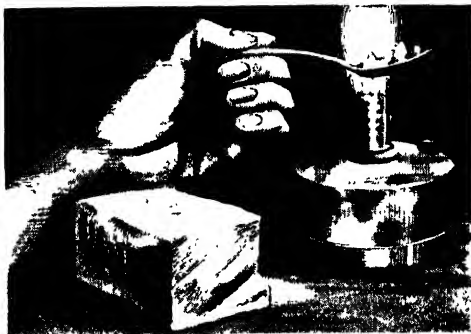


COMPOSITION OF BUTTER

cent; protein, 1.0 per cent; ash, 3.0 per cent. Of these, water is the most variable. According to the standard fixed by the United States government, butter should contain not less than 80 per cent of fat nor more than 16 per cent of water.

Food Value. Butter is highly nutritious, and is one of the most wholesome and most easily digested of all food fats. About 19.7 per cent of the total fat in the daily food of the average person is furnished by butter.

Production. For its size, Denmark is the leading butter-making country of the world, and the quality of the Danish product is unequaled. In quantity, the United States is foremost among the butter-making countries, with a total creamery of about 1,400,000,000



A TEST FOR PURITY

Explanation appears in the text

pounds a year. About 1,000,000,000 pounds are made on the dairy farms, which is nearly as great as the creamery output. The value yearly is over \$1,000,000,000. The leading butter states are Minnesota, Wisconsin, Iowa, Illinois, New York, Pennsylvania, Michigan, and Ohio. Among the Canadian provinces, Ontario leads in the production of homemade butter, and is second in the output of creameries and factories; Quebec produces the largest amount of factory and creamery butter. The yearly output of homemade butter in all the provinces is about 160,000,000 pounds, and of factory and creamery butter, about 70,000,000 pounds.

Adulterants and Imitations. Cottonseed and other oils and various fats have been used as adulterants of butter. The most common manufactured substitute is a fat made of suet, oil, butter, cream, and milk, known as *oleomargarine* (which see). Renovated or process butter is a butter of poor quality from which disagreeable odors and flavors have been removed, and to which cream or milk has been added to give it a good appearance. Such a product is much inferior to oleomargarine, and its sale is strictly regulated by law. In the United States, all butter of this character must be labeled *renovated*.

Tests of Purity. If butter does not smell sweet it has fermented and has become rancid. Such butter has probably been made from old cream collected for several days, and it contains decomposing particles of fat. There is a char-

acteristic test which pure butter, free from artificial fats, responds to easily. If a bit of butter be melted in a test tube set in warm, not hot, water, and kept at an even temperature for half an hour, it should at the end of that time show clear if pure; if not pure, or if it contains artificial fat, it will be cloudy. A little pure butter heated in a spoon over a gas jet will simmer evenly and quietly, but will proclaim the presence of oleomargarine by noisy sputtering and popping. E.H.F.

Related Subjects. The reader is referred in these volumes to the following subjects.

Adulteration of Food-stuffs and Clothing (Butter and Its Substitutes)

Creamery
Cream Separator
Dairying
Oleomargarine

BUTTER AND EGGS (weed). See TOAD-FLAX.

BUTTERCUP, OR CROWFOOT, a dazzling yellow wild flower or weed of the roadside and field, found in England, the United States, and Canada. From May to September, this "little children's dower" brightens the waysides and pasture-lands, but the farmer is not pleased at its appearance; to him it is a troublesome weed. Because of the bitter, burning juice in the plants, animals will not eat them, and therefore they may be said to have no persistent enemies; thus, naturally, their growth is unchecked.

The buttercup grows from one to two and one-half feet high. The leaves usually have three parts, and are notched; the flowers, about an inch across, have five smooth, shining petals of yellow, which form the "cups" the children hold under their playmates' chins, to test their liking for butter.

There is also a *creeping buttercup*, whose stem creeps along the ground and sends out new roots here and there; also a *swamp butter-*



The buttercups, bright-eyed and bold,
Held up their chalices of gold
To catch the sunshine and the dew

—DORR, *Centennial Poem*.

cup, which loves the moist, shady spots, and a yellow *water buttercup*, whose blossoms float on the water. B.M.D.

Scientific Names. The buttercups belong to the family *Ranunculaceae*. The common buttercup is *Ranunculus acris*; the creeping buttercup, *R. repens*; the swamp buttercup, *R. septentrionalis*; the yellow water buttercup, *R. delphinifolius*. See illustration of members of the buttercup family, in article BOTANY

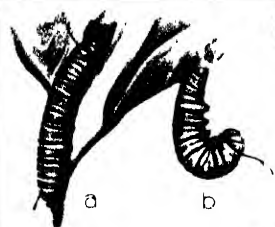


BUTTERFLY. This beautiful insect has wings so dainty and so brightly colored that it is often referred to as a "winged flower." That its name is made up of two common words is perfectly plain, but the reason is not so clear. Probably the "butter" refers to the color of some of the best-known species. Little children in learning to pronounce the long name sometimes get it twisted about and give it a form which seems much more fitting—"flutter-by."

How Butterflies Differ from Moths. There are other insects which look much like the butterflies; these are the moths. In structure, the two are much alike, but there are certain sim-

ple differences which will assist anyone in distinguishing them. The butterflies are usually bright-colored and have slender bodies, while the moths are in general dusky and thick-bodied; the butterflies love the sunshine, and are to be seen flitting about only in the daytime, and rarely on a cloudy day, but the moths are abroad in the twilight. Then, too, the butterfly has a little knob, or hook, at the end of its feelers, or *antennae*, while the moth has none; but the most noticeable distinction of all is that a butterfly when it alights holds its wings erect, while a moth spreads its wings out flat. An illustration showing these fundamental differences accompanies the article MOTHS.

BUTTERFLIES



a Monarch larva

b larva changing to chrysalis



The Monarch



c Chrysalis

d Newly emerged butterfly



The Lightning Cloak



The Orange Sulphur
[Female]



The Bird's Eye Purple



The Orange Sulphur
[Male]



The Cabbage
Butterfly



The Red Admiral

The Black Road



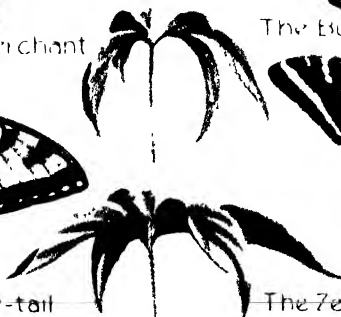
The Hop merchant



The Buckeye



The Tiger Swallow-tail



The Zebra Swallow-tail

Carl F. Gronemann

Body Structure. The body of a butterfly has three parts—head, thorax, and abdomen. The conspicuous parts of the head are the antennae, which are not only feelers, but also ears and nose to the butterfly; the eye clusters, which in some species are made up of as many as 20,000 tiny eyes, or *facets*; and the long sucking tube, or proboscis, into which the mouth parts have been modified. When not in use, this is coiled up like a watch spring. To the thorax are attached the six feeble legs and the four wings.

It is the wings of the butterfly which make it the exquisite, graceful creature that it is. They are large and strong, the front pair usually triangular and the second rounded. Their structure is curious, for they are made up of membranes stretched on a framework of double tubes. The inner tubes are filled with air; the outer ones are veins. Thickly covering the membrane of the wings are tiny scales, arranged in overlapping rows, like shingles on a roof. When observed under a microscope, they are found to resemble feathers; thus one is made to marvel at the perfection sometimes displayed in insect life. Minute as they are, these scales are of the utmost importance to the butterfly, as any child has discovered who has carelessly grasped one by the wings. When released, the little insect has not only

places butterflies and moths in the order *Lepidoptera* (which see).

Habits of Life. Butterflies do not, like birds, or even some of the lower classes of life, have the "homing" instinct. They make no sort of structure to live in, and seem to have no choice of a home spot except that the eggs must be laid on some substance which will feed the young. Thomas Wentworth Higginson, lover of butterflies, wrote:

Birds have their nests; they rear their eager young,
And flit on errands all the livelong day,
Each fieldmouse keeps the homestead whence it sprung,
But thou art Nature's freeman—free to stray

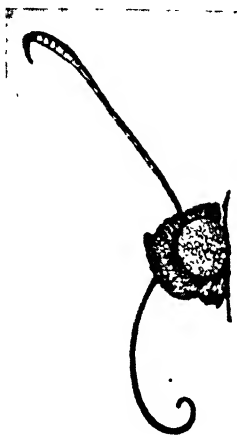
Unfettered through the wood,
Seeking thine airy food,
The sweetness spiced on every blossomed spray

Their food is chiefly the nectar of flowers, but they are very dainty eaters, seeming to need almost nothing to keep them alive.

One drop of honey gives satiety;
A second draught would drug thee past all mirth.

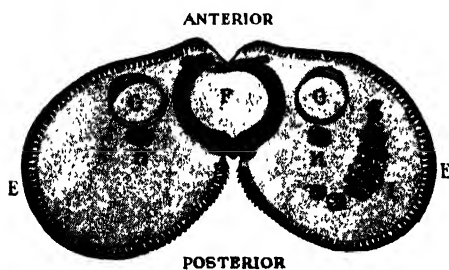
Their life is very short, lasting with most species but a few days. No specimen has been known to live longer than three years.

In one point besides their wings, butterflies resemble birds—in the decided difference in



SIDE VIEW OF HEAD

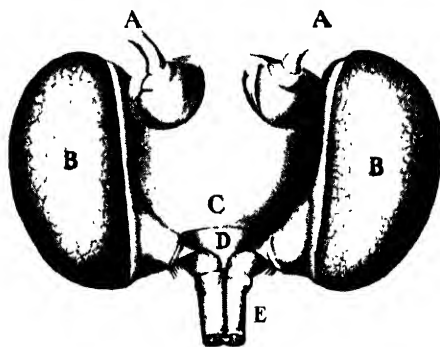
The antenna projects upward, the tongue downward. The latter coils up when not in use [See sectional view of the tongue in the next illustration]



CROSS-SECTION OF TONGUE

Two maxillae (EE) unite to form the food passage F. The trachea is G; the nerves, H. At I are shown the muscles on one side; like muscles are on the other side. The drawing is magnified 250 times.

lost much of its beauty, for all the brilliant coloring is in the scales, but it flies very feebly, or not at all. No one who wishes to collect butterflies will ever seize them by the wings, for he knows that in so doing he is ruining his "specimens." The possession of scaly wings is the outstanding characteristic that



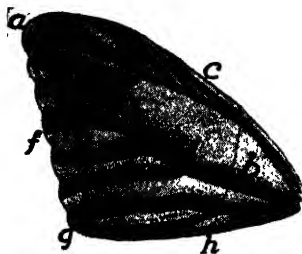
ANATOMY OF THE HEAD

Front view is shown, magnified twenty times; in life, the head is covered with scales. A, the antennae (cut off in this diagram); BB, compound eyes, C, clypeus (front, or visor); D, labium (the organ which covers the mouth); E, tongue, which is here cut off (see second picture preceding).

color, and even in size, between the male and female of the same species. So entirely different are they at times that none but a scientist could tell that they were not of two species rather than one.

There is one curious fact about butterflies which does not seem to accord with their beauty and daintiness. They love an unpleasant odor, especially the smell of decaying matter, and nothing will attract them more quickly than a rotten banana or a spoiled fish.

In the tropics, where the natives catch the great gorgeously-hued specimens for which collectors are willing to pay high prices, they make use of over-ripe fruit to attract the insects to the spot where they lie in wait.



OUTLINE OF WING

(a) Apex; (b) base, (c) costal margin; (d) discal area, (e) limbal area; (f) outer margin; (g) inner angle; (h) inner margin

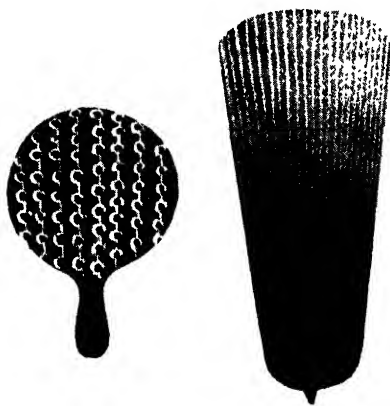
Butterflies share with some other insects the remarkable power of mimicry, which provides protective coloring. Many of the common brown and reddish butterflies that float about in the time of falling leaves look enough like dead leaves to escape detection; but there is in India a wonderful butterfly which has very special markings that aid in this deception. When its wings are spread, they are spotted with purple and orange, and are entirely unleaflike, but when the insect alights and folds its wings, the closest observer would have difficulty in distinguishing it from a dead leaf still attached to its twig. A little extension on the hind wing, like the "tail" of a swallowtail butterfly, imitates perfectly the leaf stalk, and every rib and vein is present. See PROTECTIVE COLORATION.

Life History. The Greeks used the same word, *psyche*, to mean *butterfly* and *soul*, for to them the beautiful insect was the symbol of the soul. Often in their pictures, death was shown in the image of a butterfly flitting from the dead man's lips—the soul leaving the body. The appropriateness of this conception is found in the life history of the butterfly, whose emergence from an apparent death suggests strikingly the immortality of the soul. For the butterfly undergoes a complete metamorphosis, living in four distinct forms before it has completed its life history: the egg; the *larva*, or caterpillar; the *pupa*, or chrysalis; and the *imago*, or perfect insect. The first man who ever watched a butterfly emerge from a chrysalis, to all appearance dead, must have felt it to be one of the strangest things he ever looked upon; and the knowledge that before this mummy-like stage came the dull, groveling existence of a caterpillar could but have made the wonder greater. Nor does the

wonder ever die; each time the transformation is watched, it seems as marvelous as before.

The Egg. The butterfly deposits its eggs singly or in clusters upon or near the plants on which the young must feed. The eggs of some species hatch in a few weeks, or even a few days, but others take months to come to maturity. In cold climates, the eggs deposited in the fall are not injured by winter's severity, and do not hatch until spring. When they do open, there comes out, not a winged creature which looks like the parent butterfly even as much as a scraggly little bird resembles its beautiful parents, but a crawling thing which looks and moves like a worm.

The Larva. The larva, or caterpillar, the second stage in the development, is familiar to all. The huge green worms, the cabbage worms, and the fuzzy brown, yellow, or white caterpillars are by most people as much loathed as the butterflies are admired. Many of them deserve the disgust which they occasion, for they do much harm by destroying vegetation. Most of the harmful caterpillars, however, are the larvae (young) of moths, and not of butterflies. A caterpillar does not eat casually and often daintily, as does a butterfly, but ap-



SCALES FROM WINGS

Highly magnified

plies itself industriously to this, its only task. Trees may be almost stripped of their leaves, the cabbage garden of the truck farmer may be nearly ruined; but the caterpillar must be fed, for it is storing up fat for the long weeks or months during which it can have no food. The length of time this caterpillar stage endures varies with the locality, the season, and the species. In temperate climates, it lasts from three to four months, while in the cold regions the period is often ten months; but the caterpillar never fails to know when it is over and to make preparations for the coming pupa stage.

The Pupa. The caterpillars of moths spin for themselves cocoons of silk, but those of the butterflies shut themselves up in hard, smooth cases, and are known as *chrysalids*. For the most part, these are of a dull color, escaping detection by their resemblance to the objects about them, but some are golden and shiny; and it is these which have suggested the name *chrysalis*, which means *gold*. Some of these chrysalids hang head downward from twigs or the under side of leaves; others are suspended in a nearly horizontal position by silken cords.

In the pupa state, the insect looks dead, but it breathes through small pores, and within its horny covering the mysterious life changes continue. The wings, the legs, the body—all are formed during this inactive period, which lasts with some butterflies but a few weeks, while with others it continues through the winter. When it is completed, the case splits, and the imago, or perfect insect, emerges. At first it looks little enough like an airy, bright-hued butterfly, for its wings are soft, colorless, and closely folded. But air and sunshine work a speedy miracle, and very soon the "wingéd blossom, liberated thing" is ready to float away among the "other flowers, still held within the garden's fostering."

As to the distance these full-grown butterflies can fly, there is little accurate information. Their flight seems languid, almost lazy, but they move swiftly enough to be difficult to capture when on the wing. A few species, if they do not find at hand the kind of plant food which the larvae must have, migrate in search of it, sometimes for a hundred miles or more. Many of the long flights are not really flights at all—the insects are simply borne along by the wind, as a milkweed seed or a winged maple seed might be carried.

Classification. Scientists have long names for the different species of butterflies, and any person who wishes to form a collection of any value should make himself familiar with these from some such publication as Holland's *Butterfly Book*. Here, however, a less technical classification will do. All the 650 species which appear in the United States and Canada are grouped in five families.

(1) The greatest is the family of *brush-footed* butterflies, *Nymphalidae*. Many of the most conspicuous and beautiful of the temperate-region butterflies are of this family; for instance, the familiar red-brown milkweed butterfly, or monarch, the mourning cloak, and the thistle butterfly.

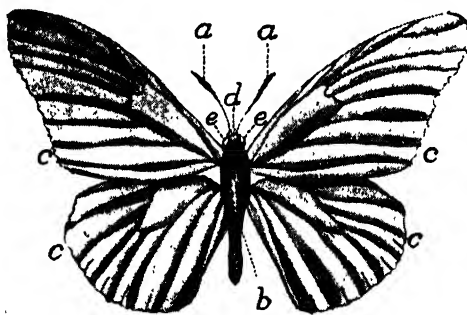
(2) A second great class is the family of so-called *blues and coppers*, *Lycænidæ*. These slender-bodied insects have gossamer wings, in shimmering blue or coppery shades. Almost all of them are small, and some, as the *hairbreaks*, have little projections, or tails, on their hind wings.

(3) The most familiar family contains the *white, sulphur, and orange tips*, *Pieridæ*, to which belong the roadside butterflies everywhere to be seen. Vary-

ing shades, from the white of the cabbage butterfly to deep sulphur, are to be found, and the size of wing expansion ranges from an inch to two and one-half inches.

(4) The *skippers* (superfamily *Hesperiina*) are a large group, but not many species of it are familiarly seen. Brown, blackish, or dull gray, these are for the most part inconspicuous and small.

(5) The most beautiful and striking of all are the large *swallowtails*, *Papilionidæ*, which are distinguished by the pronounced tails on their hind wings. They are the largest of the butterflies, and show



PRINCIPAL PARTS

(a) Antennae, (b) body; (c) wings; (d) mandibles; (e) eyes.

many exquisite colors and markings, black, yellow, greenish-white, and even reds and blues appearing on their gauzy wings. Especially admired is the great black and yellow *tiger swallowtail*, which is found almost everywhere in temperate North America.

It is in South America that butterflies most abound, and some of the tropic species are among the most gorgeous of all insects. They have not only brilliant colors, but a great wing expanse, some of them measuring eight or nine inches across.

Nature-Study Lessons. Few, if any, among living things are more interesting and more profitable for study than the butterfly in its various stages. Many specimens can be found in every part of the world; a little watchfulness and care will probably enable children to secure several different kinds, either at home or at school, under the direction of parents or teacher. The greater the difference, the more valuable the specimens will be for study.

The study of the life history of a butterfly should properly begin with the egg. Unfortunately, the pupils may not always be able to find eggs; in that case, they may begin with the second, or caterpillar, stage. Teachers and parents will find that the children will take a lively interest in the development of the caterpillar. A caterpillar may be kept in a glass case, set in a sunny place; if he is fed and given a twig and leaves to which to attach his chrysalis, the observer may soon see him spin himself into his retreat and finally emerge a perfect butterfly. Let the children keep a rec-

OUTLINE AND QUESTIONS ON THE BUTTERFLY

Outline

I. Description

- (1) Insect
- (2) Structure
 - (a) Head
 1. Antennae
 2. Eye clusters
 3. Mouth parts
 - (b) Thorax
 1. Legs
 2. Wings
 - a. Number
 - b. Framework
 - c. Membrane and scales
 - (c) Abdomen
- (3) Color
 - (a) Variation due to sex
 - (b) Protective coloration

II. Life Habits

- (1) Lack of "home"
- (2) Feeding habits
 - (a) Nectar
 - (b) Fondness for unpleasant odor
- (3) Powers of flight
- (4) Migration

III. How Distinguished from Moth

- (1) Difference in—
 - (a) Color
 - (b) Shape of body
 - (c) Shape of antennae
- (2) Flies by day; moth flies by night
- (3) Position of wings when at rest

IV. The Life Cycle

- (1) The egg
 - (a) Where deposited
 - (b) Time required for hatching
 - (2) The larva or caterpillar
 - (a) Structure
 1. Head
 - a. Eyes
 - b. Feelers
 - c. Biting jaws
 - d. Color and covering
 2. Segments
 3. Legs and leg stumps
 - (b) Self-protection by means of—
 1. Concealment
 2. Unpleasant taste
 3. Disagreeable odor
 - (c) Food
 1. Voraciousness
 2. Harm to crops
 - (d) Molting
 - (e) Duration of caterpillar stage
- (3) Pupa or chrysalis
 - (a) Distinction between chrysalis and cocoon
 - (b) Duration of this stage
 - (c) Life processes
- (4) The perfect insect or imago

V. Classification

- (1) Brush-footed butterflies
- (2) Blues and coppers
- (3) White, sulphur, and orange tips
- (4) Skippers
- (5) Swallowtails

Questions

How many butterfly families are found in the United States and Canada?

In what continent is the greatest number of these insects found?

Knowing how fragile are their wings, how do you account for the ability of butterflies to travel a hundred miles?

Taking the name *caterpillar* in its literal significance, could it be fittingly applied to the smooth green tomato worm?

What is the distinction between a cocoon and a chrysalis?

Why cannot the housekeeper, when she has destroyed all the "dusty millers" flying about her house, feel certain that her furs and flannels are safe?

What proves that butterflies are not dainty in all their tastes?

When birds migrate, it is usually because they cannot find sufficient food for themselves. How does the reason for butterfly migrations differ from this?

How would you construct a cyanide jar?

What decided difference exists between the feeding habits of the larva, or caterpillar, and those of the imago, or full-grown insect?

OUTLINE AND QUESTIONS ON THE BUTTERFLY—Continued

Questions

Why can you not always be sure when you see a male and a female butterfly that they belong to the same species?

How does the butterfly that has just emerged from the chrysalis differ in appearance from the same insect a few hours later?

Why is it not wise to allow children to make collections of butterflies?

Mention three ways in which the insect when in its larval stage protects itself from the attacks of stronger animals.

Do butterflies have a "home life" as do birds, bees, and ants?

Why are chrysalids so named?

What is the best stage at which to begin the study of the life history of the butterfly? Why is this not always possible?

How do the mouth parts of the caterpillar differ from those of the perfect insect?

How many wings has a butterfly?

Are they all the same shape?

What is the sole task of the caterpillar?

In which continent are butterflies most abundant and most gorgeous?

How many legs has a caterpillar? To what part of the body are they attached?

Describe the eyes of a butterfly.

What do the mouth parts look like when not in use?

Do the eggs of all butterflies hatch in about the same length of time?

Which are the largest butterflies, and why are they named as they are?

What explanation is given of the name *butterfly*?

Describe the remarkable manner in which a certain butterfly guards against the attacks of birds or other animals.

To what family does the beautiful "mourning cloak" belong?

What must the amateur collector particularly guard against in mounting his specimens?

What is there peculiar about the way in which a caterpillar grows? How many times does this process take place before the cocoon stage?

If you see a big, gorgeous-winged insect poised on a twig, how can you tell whether it is a butterfly or a moth? If the insect is dead and mounted, can you still tell which of the two it is?

To which group do the white cabbage butterflies belong?

Describe the correct form of net for catching butterflies.

What goes on within the cocoon during its period of quiescence?

Name the various stages in the life of a butterfly.

What is meant by a complete metamorphosis? Name another insect that undergoes the same process. Name one that does not show all the stages.

How do natives in the tropics attract butterflies for capture?

Are these insects as long-lived as ants? As bees?

What must the female find before it lays its eggs?

What double duty do the tubes in the gauzy wings perform?

Is there any kind of caterpillar which pays for the food it eats?

What is meant by "protective coloration"? Do any other insects have it?

Of what did the Greeks make the butterfly representative? Give the myth of Psyche.

Explain the allusion in the italicized word in the following quotation from Shakespeare:

For men, like butterflies.
Show not their *mealy* wings but to the summer

ord of daily observations of any changes they may notice. Not only will they be interested in the caterpillar, but they will, unknown to



LIFE HISTORY OF A BUTTERFLY

(1) Eggs, highly magnified; (2) caterpillar, (3) chrysalis; (4) butterfly.

themselves, be learning how to observe carefully and systematically. Incidentally, there will be found many opportunities to teach lessons of kindness.

After the butterfly has been observed, it should be permitted to fly away, without being touched with the fingers, for butterflies do no harm, and they make all out-of-doors more beautiful.

Butterfly Collections. The mania to collect is a natural one in children, and butterflies have always been one of the favorite objects of collectors. So far as possible, unscientific collections should be discouraged, for it is far better for the children to observe the live insects. If, however, collections are to be made, they should be made as carefully as possible, and the mounted insects should be identified.

First of all, the collector needs a net of tarlatan, or mosquito-netting, with a light handle from three to five feet in length, the ring being about a foot in diameter and the bag about eighteen inches deep. When the insects have been caught with this instrument, they are killed by being placed in a wide-mouthed bottle containing cyanide of potash. A few lumps of this substance are placed in the jar, cotton is laid over them, and then a heavy paper, pierced with many holes, is pasted over the cotton. The bottle should be kept closed when not in use, and care should be taken in handling it, as the cyanide is poisonous.

When taken from the poisoning jar, the insects should be pinned upon the cork bottom of a tin "field-box," care being taken not to brush the wings. The final mounting may be upon cork or some other substance, such as

velvet, as the collector may prefer. Scientists who make a business of collecting and mounting butterflies have an elaborate series of instruments, including setting blocks, drying racks, and special pins and needles, but the equipment described above will be sufficient for amateur collectors.

W.J.S.

Related Subjects. In the following articles will be found much that will prove helpful to the reader who is interested in butterflies.

Antennae	Larva
Caterpillar	Metamorphosis
Chrysalis	Moth
Cocoon	Protective Coloration
Insect	Pupa

BUTTERFLY WEED. See MILKWEED

BUTTERMILK, the milky liquid remaining after butter has been made from cream. It contains casein, sugar, a small amount of lactic acid, some butter fat, and a few other substances distributed through the liquid, which is largely water. The lactic acid gives buttermilk a slightly sour taste, and the casein, sugar, and fat render it of some value as a food. When fresh, it constitutes a nourishing drink; but as it absorbs bacteria rapidly when exposed to the air and soon becomes unwholesome, buttermilk designed for drinking should be kept in closed vessels and on ice. See **FOOD** (Chemistry of Food); **MILK**; **BUTTER**.

BUTTERNUT, OR **WHITE WALNUT**, a large spreading tree of the walnut family, native to North America, and valued for its wood and oily nuts. It is found as far west as Kansas



BUTTERNUT
Leaves and fruit.

and the Dakotas, and ordinarily reaches a height of fifty to seventy-five feet. The bark is a distinctive feature, with long furrows extending lengthwise on the trunk. The pointed, oblong nuts are contained in spongy, hair-covered, ribbed husks, and while soft and green are often preserved as pickles. Later, when dried, they are hard-shelled, sweet, and oily, of excellent flavor, but not marketed as much as other nuts. Country children, however, like to gather them for eating during the winter

White walnut wood is light brown, soft, coarse-grained, with a satiny luster, and is used in cabinet work and interior finishing of houses. The sap has been used a little in sugar-making; the root bark is employed in medicine. The bark of the stems has been used for dyeing. One still hears about the homespun, home-dyed "butternut" uniforms of some regiments in the War of Secession. See WALNUT. B.M.D.

Classification. The botanical name of the butter-nut tree is *Juglans cinerea*.

BUTTERWORT, *but' ur wurt*, any one of a genus of insect-trapping plants, widely distributed in bogs and marshes (see CARNIVOROUS PLANTS). The common butterwort, which has a wide range in the northern part of the northern hemisphere, is typical of these plants. Each plant has a basal rosette of fleshy leaves that secrete a sticky substance attractive to insects. When an insect settles on a leaf, the edges curve in and entrap the unwary visitor, which dies and is digested by the plant as food. The common butterwort has attractive, violet-colored flowers, borne singly on the ends of slender stems. In Sweden and Lapland, the leaves are used to curdle milk. Some attribute the name to this use; others refer it to the buttery feel of the leaves. B.M.D.



BUTTERWORT

Scientific Names. The butterworts form the genus *Pinguicula*, in the family *Lentibulariaceae*. The common butterwort is *P. vulgaris*.

BUTTERWORTH, HEZEKIAH (1830-1905), an American author and editor, whose stories and histories for young people are among the best of juvenile writings. He was born and reared on a Rhode Island farm, received a common school education, and by writing stories earned enough to pay for a course in rhetoric and composition at Brown University. With this preparation, he went to Boston with the idea of becoming a writer, and soon found a minor position on the staff of *The Youth's Companion*. In 1871 he became its editor, and it was truthfully said that *The Companion* carried his name around the world, for his

energy, enthusiasm, and personality caused the periodical to grow in circulation from 140,000 to 400,000 in the decade between 1877 and 1887. He was its editor until 1894.

Butterworth's published volumes number about sixty. Seventeen of these belong to the *Zigzag* series, books of travel that combine fact and fiction, in which he takes the reader all over the world. These and his biographical and historical tales—*In the Boyhood of Lincoln*, *The Wampum Belt*, *In Old New England* and others—are full of charm and interest to young readers. He also wrote numerous ballads, cantatas, and hymns, his *Bird with the Broken Wing* being a popular Sunday School song. Butterworth traveled extensively in Europe and in America, and was also a lecturer.

BUTTON. Buttons were used originally for decorative effect alone. The robes of the Greeks and Romans were kept in place by means of strings, girdles, or brooches, and it was not until more complicated garments came into use that buttons were employed as fasteners. Even to-day not all people in enlightened lands use buttons. For example, the Mennonites are forbidden to fasten their clothing with anything but hooks and eyes.

As to the materials of which buttons are made, it has been said that it would be hard to find any material that has not been used in their manufacture. Gold, silver, iron—in fact, metal of all kinds—wood, paper, bone, horn, shell, stone, glass, potatoes, vegetable ivory, and even dried blood are among the materials employed.

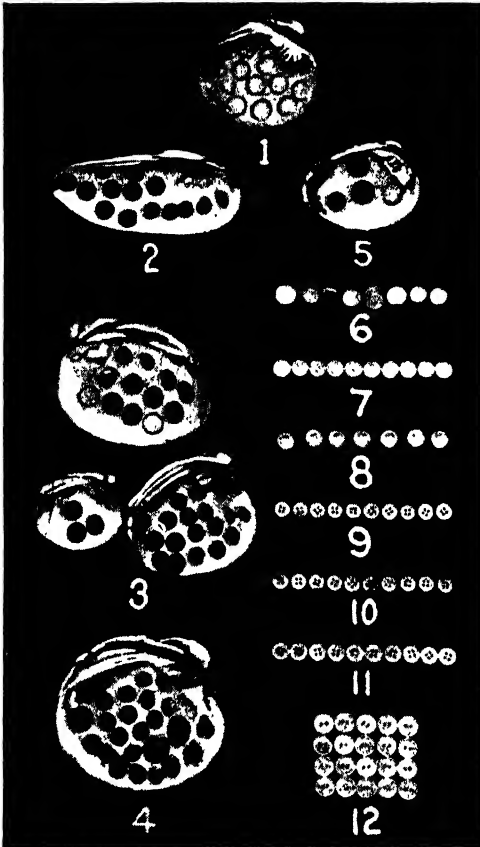
Buttons are of two general classes: those which are attached to the garment by means of threads which pass through holes in the buttons themselves, and those which have a shank or loop of metal, or tuft of cloth, by means of which they are affixed. The head of the button may or may not be covered with cloth to match the material to which it is to be attached.

Pearl Buttons. One of the most important branches of the button industry has for many years been the manufacture of pearl buttons. The luster of the inside shell of the pearl oyster has always been considered singularly attractive, and soon after it was found to be easily made into buttons, the pearl-button industry grew until it exceeded that of any other kind. In the United States, the industry was handicapped because the shells had to be brought from great distances, and the cost of production was therefore high. In the latter part of the nineteenth century, a substitute for the pearl oyster shell was found in the "niggerhead" mussel of the Mississippi River, and the industry received a fresh impetus. These shells are collected at all times, but those taken during the winter are found most suitable for button-making. They are soaked for a few

days in clear, fresh water, are then cut to the required sizes by drills; holes are bored, and when polished, the buttons are ready for market. The finished buttons are fastened to cards containing a certain number, all of the same

making industry. Muscatine, Ia., is the center of the industry.

The pearl mussel is a microscopic, free-swimming creature in infancy, and then for a time lives as a parasite on the gills of fishes. Valuable



BUTTONS FROM SHELLS

(1) Wortyback niggerhead, showing how blanks are cut; twelve blanks are started, (2) black sand shell, from which fourteen blanks have been cut, (3) niggerheads: with fourteen holes, two partly cut blanks; with ten holes; with four holes; (4) niggerhead, showing proper utilization of raw material, (5) cutting: butterfly shell, with three holes, from which blanks have been cut; one blank in place; (6) rough blanks, as sawed from shell, (7) grinding: the rough blanks are placed on a traveling band that passes under grindstones; (8) centering: a depression is made in the center of each blank; (9) drilling: the holes are drilled in the central depression, (10) smoothing: the buttons are smoothed with pumice stone and water in revolving kegs; (11) polishing: the buttons are polished in similar manner; (12) carding: the polished buttons are sorted, sewed to cards, and are then ready for sale.

size. The first button factory on the Mississippi was opened in 1801, and now many towns and villages for a distance of 200 miles along the river banks, from Fort Madison north to Sabula, have their mussel-fishing or button-



BUTTONS FROM IVORY NUTS

(a-b) Ivory nut, with broken shell exposing the nut; (c) partly turned piece, (d) white button; (e) the same, sprayed with shellac, (f) sprayed, developed, and shellac removed.

pearls are sometimes found in these mussels; great hoards of pearls, collected by the Indians, have been discovered in their mounds. Several rows of pearl buttons may be seen on the garments of street hawkers in British cities.

Vegetable Ivory Buttons. Perhaps the most interesting of all button-making processes is that by which they are manufactured from *vegetable ivory*, as the fruit of the corozo nut palm is called. The tree produces clusters of nuts in husks sometimes as large as ostrich eggs. The nuts are shelled by machinery, and the kernels are extracted. The application of heat causes the nut to become as hard as stone, with the appearance of ivory. Vegetable ivory can be dyed to any desired color by chemical processes. The value of vegetable-ivory buttons produced in the United States alone exceeds \$8,000,000 a year. See IVORY PALM.

Metal Buttons. Except when used for uniforms, metal buttons are employed principally where strength rather than ornamentation is required. They are made by cutting out disks or blanks from sheet metal, and then molding or pressing them to the desired shape. Designs or letters are stamped by means of dies. Waterbury, Conn., is the center of the metal button industry in America.

Most of the buttons made in the United States are used in that country; few are imported, and practically none are exported.

Derivation. The word *button* was derived from the French *bouton*, which literally means something *pushed out*; it is appropriate, in view of the fact that buttons, to be useful, must be pushed into and out of buttonholes

BUTTONWOOD. See SYCAMORE.

BUZZARD, a name for certain species of heavily built, broad-winged hawks common in Europe and America. The so-called *turkey buzzard* (which see) is really a vulture. Buzzards prey on field mice, squirrels, insects, and smaller birds. They sometimes capture poultry; but most of them are beneficial, rather than harmful, to agriculture. The more important North American buzzards are described in these volumes under **HAWK**. D.L.

Scientific Name. Buzzards belong to the family *Falconidae*. Most of the hawks to which the name buzzard is given are grouped in the genus *Buteo*.

BYELUKHA, *bi lu' kah*. See **ALTAI MOUNTAINS**.

BY-LAW, a private regulation made by an incorporated body for the conduct of its affairs. In short, by-laws are simply agreements or rules as to methods of work among members of an incorporated business organization. The rules of societies which outline the conduct of their affairs are also called by-laws. The power to make or change its by-laws belongs to every corporation, even without express authority. A by-law which is counter or contrary to a provision in a charter or to a settled rule of law is invalid.

BYLINY, *bi' lin ie*, epic songs of Russia. See **RUSSIAN LITERATURE**.

BYNG, *bing*, **JULIAN** (Hedworth George) Lord (1862-), seventh son of the second Earl of Strathford, a great military leader and a former Governor-General of Canada. He was destined for a military career, and early showed aptitude in that direction. At the age of thirty-six, he was made a major, and three years later a colonel. Prior to the World War, he was engaged in active service in the Sudan expedition, and from 1899 to 1902 he served in South Africa. At various times later, he was connected with the cavalry arm of the service, then in command of an army corps. In the World War, he served first in the Dardanelles, in 1915; in 1916 he was placed in command of the Canadian corps; from 1917 to 1919, he commanded the third army. In recognition of his services on the Continent from 1915 to 1918, he received the highest decorations of the allied governments of France, Italy, Belgium, and the United States.

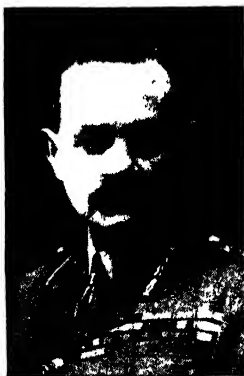


Photo. U & U

LORD BYNG

Lord Byng was named Governor-General of Canada in June, 1921, and he served for the usual term of five years. In 1902 he married Marie Evelyn Moreton, who had achieved some fame as a novelist.

BYRD, *bird*, **RICHARD EVELYN** (1888-), an American aviator, explorer, and naval officer, the first man to fly over both the North and the South Poles. He is a brother of a governor of Virginia, and a direct descendant of the founder of Richmond, an influential official in the colony. Byrd was born in Winchester, Va., and was educated at the Shenandoah Valley Academy, Virginia Military Institute, the University of Virginia, and the United States Naval Academy. After four years on sea duty, he entered the aviation arm of the service.

In 1925 he went to Greenland with the MacMillan expedition, which used airplanes for the first time in Arctic exploration. As flight commander, he gained experience which convinced him that a flight to the Pole was possible, if made in the spring. Accordingly, on May 9, 1926, accompanied by his pilot, Floyd Bennett (died 1928), Byrd flew in a Fokker monoplane from Spitsbergen to the Pole, which he circled several times.

In July, 1927, he attempted to fly across the Atlantic Ocean to Paris in the Fokker airplane *America*, with an alternate pilot, Bert Acosta, and two navigators, Lieut. George O. Noville and Bernt Balchen. The flyers were lost in storm and fog over France, which forced them to land in the sea near Ver-sur-Mer. The "successful failure," as the flight has been called, gave added proof that the trip across the Atlantic can be made; but even more, it proved how much must still be done before ocean voyages by air become reasonably safe.

In the fall of 1928, Commander Byrd started on a scientific expedition to the Antarctic lands and seas. His party of thirty-two included notable scientists from many fields: geology, meteorology, physics, radio engineering, geography, topography, aerology, and others. The equipment was the most elaborate ever used in scientific exploration. It included four airplanes to be used for short trips from the base into unexplored regions. Commander Byrd



Photo. U & U

RICHARD E. BYRD

flew over the South Pole in November, 1929. Because of his service to science, Congress raised him to the rank of rear admiral. See AIRCRAFT (The Byrd Enterprise); POLAR EXPLORATION; ANTARCTIC LANDS AND SEAS.

BYRON, GEORGE NOEL GORDON, Sixth Lord (1788-1824), an English poet who in his own day was looked upon as second only to Shakespeare. Handsome, passionate, with a carefully cultivated air of mystery and gloom, he stood as one of the most prominent figures of his day. His frequent bitter smile was copied as carefully as was his loose collar and flowing tie, and the word "Byronic" acquired a very definite meaning, which persists to this day.

Byron was born in London, on January 22, 1788. Until the age of seven, he was entirely under the care of his mother, and to her unwise indulgences and equally unwise severities the waywardness that marked his after life may have been partly due. On reaching his seventh year, he was sent to the grammar school at Aberdeen, and four years after, in 1798, the death of his grand-uncle gave him the titles and estates of the family. Mother and son then removed to Newstead Abbey, the family seat, near Nottingham. Soon afterward, Byron was sent to Harrow, where he distinguished himself by his unsystematic reading, rather than by careful study. In athletic sports he excelled, despite the lameness which had resulted from childhood illness. In 1805 he entered Trinity College, Cambridge. Two years later appeared his first poetic volume, *Hours of Idleness*, which was criticized with unnecessary severity in the *Edinburgh Review*. This criticism roused Byron, and drew from him his first notable effort, the celebrated satire, *English Bards and Scotch Reviewers*.

In 1800, in company with a friend, Byron visited the southern provinces of Spain and voyaged along the shores of the Mediterranean. The result of these travels was *Childe Harold's Pilgrimage*, the first two books of which were published on his return in 1812. The poem was immediately successful, and Byron "awoke one morning and found himself famous." During the next two years, *The Giaour*,

The Bride of Abydos, *The Corsair*, and *Lara* appeared, and Byron's literary reputation grew steadily.

During these years, however, he was living in the most reckless dissipation. In 1815 he married the daughter of Sir Ralph Milbanke, evidently intending to give up his reckless life; but the marriage proved unhappy, and in about a year Lady Byron left him and refused to return. This rupture gave rise to much popular indignation against Byron, and reports were circulated which caused him to leave England, with an expressed resolution never to return. He visited France, the field of Waterloo, Brussels, the Rhine, Switzerland, and the north of Italy; for a time he lived at Rome and later at Geneva, where he completed his third book of *Childe Harold*. Not long after appeared *The Prisoner of Chillon*; *The Dream*, and *Other Poems*; in 1817, *Manfred*, a tragedy, and *The Lament of Tasso*, all of which helped to make him as popular as a poet as he was unpopular as a man.

From Italy, Byron made occasional excursions to the islands of Greece, and at length visited Athens, where he sketched many of the scenes of the fourth and last book of *Childe Harold*. Between 1817 and 1822 appeared, among other poems, five books of *Don Juan* and a number of dramas. While living at Pisa, he was for a time intimate with Shelley, one of the few men whom he entirely respected, and with whom he was really confidential. Shelley brought out all that was best in his nature, and had the association not been broken by Shelley's tragic death, Byron might in time have found himself and worked out a mode of life which would have been worthy of his powers. Besides his contributions to *The Liberal*, a periodical which he helped Leigh Hunt and Shelley to found at this time, he completed *Don Juan*, also *Werner*, a tragedy, and *The Deformed Transformed*, a fragment. These are the last of Byron's poetical works.

In 1823, troubled perhaps by the consciousness that his life had too long been unworthy of him and driven by an absolute passion for liberty, he threw himself into the struggle for the independence of Greece. In January, 1824, he arrived at Missolonghi, where he was received with the greatest enthusiasm. The air of Missolonghi began to affect his health, and on April 9, 1824, while riding in the rain, he became ill; a fever followed, which ten days later ended fatally.

Byron's natural force and genius were perhaps superior to those of any other Englishman of his time; they won for him in his own day a fame which it is hard for those of a later day to understand. After his death, his work was for some time as far underrated as it had been overrated during his life, and it



BYRON

No one else—except, perhaps, Wordsworth—who could write so well could also write so ill. "I can never recast anything," he said; "I am like the tiger—I go grumbling back to my jungle."

is only within the last few decades that a calm judgment has been passed on his writings. These will live on account of their descriptions of nature, the hatred of sham which they express, and their keen insight into the heart of man.

In his own day, quotations from Byron were on everyone's lips, and even to-day some of them are everywhere familiar:

No sleep till morn, when Youth and Pleasure meet
To chase the glowing hours with flying feet.

Man!

Thou pendulum betwixt a smile and tear.
A change came o'er the spirit of my dream
Man's love is of man's life a thing apart;
'Tis woman's whole existence.

The isles of Greece, the isles of Greece!
Where burning Sappho loved and sung.

BYZANTINE, *bi zan' tin*, **EMPIRE**, called also the Eastern, Greek, or Later Roman Empire, once played a very important part in the history and civilization of Europe, for all through the Dark Ages it stood as a bulwark against the barbarians and guarded from their inroads the precious legacy of culture which had been left by the ancients.

For almost a thousand years, from the death of Theodosius the Great, in A.D. 395, to the fall of Constantinople, in 1453, the Byzantine Em-



BYZANTINE EMPIRE

Its extent during the reign of Justinian.

pire existed as a separate dynasty, with its capital at Constantinople. Before his death, Theodosius divided his dominions between his two sons, Honorius and Arcadius, and the latter was the first of the Byzantine emperors. He proved a weak ruler; he made few attempts to hold his power, but permitted it to be exercised by ministers. His son, Theodosius II (reigned 408-450), was the next emperor, but in reality Pulcheria, his sister, was the real chief of state. An able ruler she proved to be, carrying on successful war against the Persians and gaining accessions of territory by helping the Western emperor, Valentinian III. Ravages of Attila and the Huns were averted only by the payment of an annual tribute.

The emperors who followed were men of ability, who placed the empire on a sound basis financially and trained an excellent body of soldiery, so when Justinian came to the throne in 527 he found all things for material advancement ready to his hand. He proved fully able to take advantage of the preparations which these earlier emperors had made, and brought the empire to the highest point of prosperity and power that it ever attained. His aim was to make his dominions one country, in fact as well as in name, and his compilation of laws, as well as his conquests, were directed toward that end.

His unfortunate successor, Justin II (reigned 565-578), was harassed on one frontier by the Persians, on the other by the terrible Avars. Most of Italy was lost to the Lombards. The reign of Heraclius (610-641) presented a series of overwhelming reverses, retrieved later by glorious victories. The Persians took Syria, Palestine, and Asia Minor, and the invading hordes advanced to a point within sight of Constantinople. Shrewdly gaining time by a humiliating treaty, Heraclius collected his forces and inflicted a defeat upon the Persians at Issus. But a new enemy was gathering strength, whom the exhausted outlying provinces were too weak to resist—the Mohammedans, with their fanatical missionary zeal. Between 635 and 641, the latter captured Syria, Judea, and all the African possessions, but this resulted in good rather than harm to the empire, which thereby became more truly a unit.

The eighth and ninth centuries saw a peculiar religious struggle—the war of the Iconoclasts (which see). This weakened the empire at a time when it needed all its strength to oppose its enemies. One ruler tore down images and closed monasteries and convents; the next restored them. Not until the latter half of the ninth century was the controversy finally settled against the Iconoclasts. One of the outstanding figures during these years was the Empress Irene (reigned 797-802), who had formed the ambitious plan of uniting the Eastern and Western empires by marrying Charlemagne. The Bulgarians were very troublesome during the reign of Leo V (813-820), and in the succeeding reign the Saracens gained a firm foothold in Crete and Sicily.

The Macedonian dynasty (867-1057) established a rule that was on the whole wise and beneficial. The empire made some distinct gains, as in the reduction of the Bulgarian kingdom to the rank of a province in 1018. But the Seljuk Turks were constantly threatening, and under the weak emperors who followed the Macedonian line, they possessed themselves of nearly all of Asia Minor.

The steady advance of the Mohammedan power alarmed all Christian Europe, and during the reign of Alexius Comnenus (1081-

1118) began the wonderful movement known as the Crusades. As the hosts marched toward Asia Minor by way of Constantinople, the movement necessarily had an important influence on the fortunes of the Byzantine

Empire. Alexius wanted help against the Turks, but the vast numbers that responded alarmed him; their depredations within his territory led to serious conflicts, and finally, under later emperors, to open hostility. In 1204 Constantinople was taken by the Crusaders, who established the Latin Empire (1204-1261), with Count Baldwin of Flanders as first emperor.

This Latin Empire was never strong, and in 1261 the ruler of Nicaea, Michael Palaeologus, took Constantinople and reestablished the Greek Empire. His dynasty lasted until the downfall of the empire in 1453.

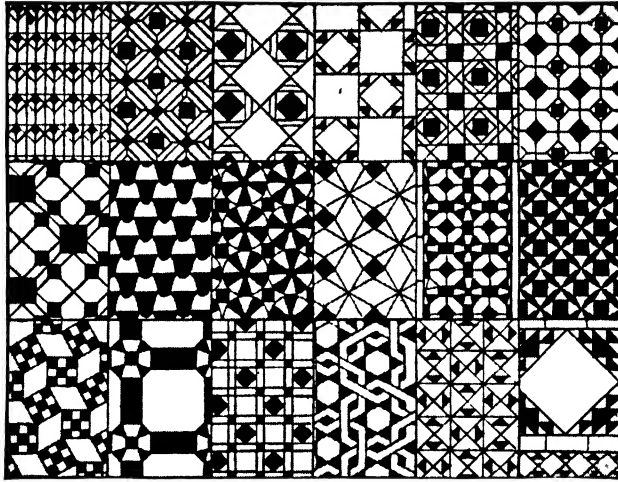
The Turks were steadily pressing closer and closer, but by this time it was the Ottoman Turks, who had overthrown the Seljuks. Province after province fell into their hands, and by the beginning of the fifteenth century, the emperors were practically vassals of the sultan. In 1453 the Turks, with an army of 400,000 men under Mohammed II, captured Constantinople, and the Byzantine Empire was at an end. They yet held the city at the beginning of the World War in 1914, and their diplomacy preserved it to them after that conflict.

By 1453, the western countries of Europe had developed to a point where they could not easily be overthrown by the Mohammedan conquerors of Constantinople; but had the Byzantine Empire not stood through so many centuries at the gateway of Europe, fighting back the barbarous hordes, all Europe might have been swept over. Without it, too, much that was best in the world's past would have been lost, and all that is best in modern civilization would have been retarded for hundreds of years. This is the true significance of the Byzantine Empire.

Byzantine Art. Not only did the great Byzantine Empire guard the art and learning of the Greeks and transmit them to Western

Europe when its scholars were scattered after the conquest; it developed an art of its own. This dated from the time of Constantine (A.D. 330), and was to a certain extent an endeavor to give expression to the new elements which

Christianity had brought into the life of men. From the first, the tendency was toward an almost Oriental splendor, rather than toward the beautiful simplicity of the Greeks. Richness of material, brilliance of color and decorative effect were the prime aims of the artist. After the Renaissance, the Venetian school of painters borrowed many of their principles from



BYZANTINE ORNAMENTS
Marble mosaics from the Church of Saint Mark's, Venice.

Byzantine art, and the result was an unsurpassed richness of color.

In sculpture, the aim was the same—toward ornamentation, extravagant costumes, and elaboration of details rather than the true proportion of parts and the dignity and correctness of outline for which the Greeks had striven. The naked figure or simple draping were no longer seen; models were not employed, and the figures showed little pretense at being true to nature. Despite this artificiality, however, many of the works of the best period, from the sixth to the eleventh century, possessed a considerable beauty and dignity.

One of the favorite branches of art was mosaic work, and in this the artists succeeded in obtaining a characteristically brilliant effect with costly stones.

In the illustration above, we have collected eighteen different specimens of mosaic ornamentation. A study of them will reveal the fact that art and industry have applied them to modern uses, or have slightly modified them. Oilcloths and linoleums show many designs whose sources are Byzantine.

Related Subjects. The reader is referred to the following articles in these volumes:

Constantinople	Dark Ages	Justinian
Crusades	Iconoclasts	Saracens

BYZANTIUM, *bezan'she um*, the original name of the city of Constantinople (which see). It was changed to Constantinople in A.D. 330 by Constantine the Great, who made it the capital of his empire. See **CONSTANTINE**.

THE WORLD BOOK

MODERN COMPREHENSIVE PICTORIAL

Cc

C, the third letter in the English alphabet, as well as in all other alphabets derived from the Phoenicians. In English, it is really an unnecessary letter, except as used in the digraph *ch*, for its soft

7 C

sound is represented by *s*, its hard sound by *k*. The Greek *gamma*, with the sound of hard *g*, was transformed by the Romans into two letters, which seem to have been used interchangeably. Thus, to this day some authorities write *Caius* Julius Caesar, and others *Gaius* Julius Caesar.

The Phoenician letter from which the Greek *gamma* was taken, and through which the modern *c* was derived, is supposed to have been a picture of a camel's head, which in time was simplified into a symbol much like the figure 7. The Greeks turned this around, and the Romans gradually made its straight lines curved, so that it became the *c* of to-day.

CAABA, *kah' bah*, a variant of Kaaba (which see).

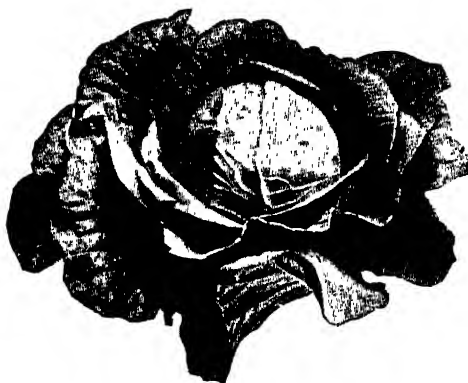
CABAL, *ka bahl'*, now a term of reproach, originated in an English Ministry which united for a party purpose under the reign of Charles II. The word *cabal*, meaning *secret*, was formed from the initials of the persons taking part in the intrigue, Clifford, Ashley, Buckingham, Arlington, and Lauderdale. This faction, though unpopular, was essentially a committee of the Privy Council and proved a forerunner of the modern Cabinet. See PRIVY COUNCIL; CABINET.

Conway Cabal. In American history, this name was given to a faction organized in 1777 among a group of officers in the colonial army, having for its prime object the displacement of Washington by Gates. Conway, a brigadier general, joined the "cabal" so earnestly that it was known by his name. Horatio Gates was to be promoted above Washington, with power to supersede him, and Conway was to be inspector general. In the correspondence that followed, Washington was abused; the affair became so notorious that Conway resigned and went to France, while Gates and Mifflin were removed from the board of war. The trickery and meanness of the conspiracy were so apparent that the scheme had the effect of raising rather than lowering Washington in public esteem.

CABALLAH, *kab' a lah*. See OCCULT.

CABBAGE, one of the commonest of garden vegetables, the parent stock from which the

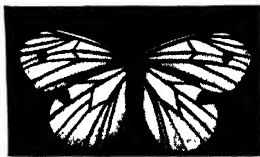
Brussels sprouts, the cauliflower, and the kohl-rabi (all of which see) have been derived. Originally it was a wild plant growing on the shores of Britain, but the cultivated varieties have spread all over the temperate zones of



CABBAGE

the world. Only the leaves are eaten, and in the common varieties these are compactly folded together into a rounded, dense head sometimes nearly a foot in diameter. The word has come indirectly from the Latin *caput*, meaning *head*. The headed cabbages are of several kinds, namely, the green, the

red or purple, and the Savoy, or wrinkled-leaved, varieties. The red cabbage is used chiefly for pickling, while the green is either cooked in various ways and served hot, or eaten raw as salad. The German *sauerkraut* is made of cabbage salted and pressed in barrels until it ferments slightly. Cabbage is one of the most valuable of table vegetables, and should be a regular part of the family diet. Raw cabbage contains vitamins A, B, and C, the third of which prevents scurvy (see VITAMINS). Present also are lime and iron, as well as cellulose, valuable for its laxative effects. If cooked quickly, cabbage retains its nutrients. Baking or steaming is preferable to boiling, but raw cabbage is the most wholesome form.

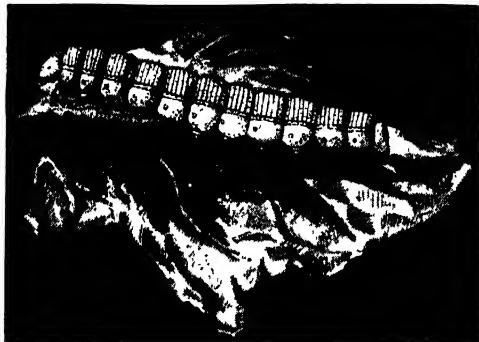


CABBAGE BUTTERFLY

Cabbages are also fed to cattle, and the Channel Islands, the home of a fine breed of cattle, produce a remarkable cow cabbage which often grows to a height of fifteen feet.

Cabbages may be had the entire year, for autumn as well as spring and summer plantings yield excellent results.

Cabbage Enemies. There are several fungus growths which attack cabbage plants, often doing great damage; no effective remedy has been found except in a rotation of crops and the planting of the vegetables in fresh soil.



CABBAGE WORM ON LEAF

Of insect pests, the most destructive is the *cabbage worm*, the larva of the common white butterfly. These pests sometimes practically destroy cabbage gardens by feeding on the leaves and burrowing into the heads of the cabbages. Arsenate of lead or Paris green may be sprayed on the plants before the heads are more than half formed. After the plants are developed, hellebore may be used. Directions as to the quantity and the method of application must be secured from a reliable authority.

B.M.D.

Scientific Name. The scientific name of the cabbage family is *Cruciferae*. The cabbage is classed as *Brassica oleracea*.

CABBAGE PALM, a name given to various species of palm trees, whose young, tender leaf buds resemble the cabbage, and when pickled or boiled are used as food. A cabbage palm found in the Southern United States, also called *palmetto*, has fan-shaped leaves and grows to a height of from thirty to fifty feet (see PALMETTO). The cabbage palm of the West Indies is a graceful tree that sometimes grows to be 200 feet tall. Its botanical name is *Oreodoxa oleracea*.

G.M.S.

CABELL, *ka bel'*, JAMES BRANCH (1870-), an American author and satirist, born in Richmond, Va., which city has continued to be his home. He was graduated from William and Mary College at the age of nineteen, and immediately entered upon a literary career. His first employment was on the *Richmond Times*; from 1890 to 1901 he served in turn on the staffs of the *New York Herald* and the *Richmond News*. During the next eight years, while contributing variously to magazines, he was engaged in compiling a genealogy of the Branch family, two volumes of which appeared in 1906 and 1911. In addition to his average production of a novel a year, Cabell served as president of the Virginia Writers' Club (1918-21), and later was editor of the Virginia War History Commission. Cabell writes in a vein of subtle humor; his novels are allegorical and fantastical in character.

Representative Works. *The Eagle's Shadow* appeared in 1904, followed by a score of other novels, including *The Line of Love*, *The Soul of Melicent*, *The Certain Hour*, *The Cream of the Jest*, *Beyond Life*, *Jurgen*, *Figures of Earth*, *The Jewel Merchants*, *The High Place*, *The Silver Stallion*, and *Something About Eve*.

CABILDO, *ka bil' doh*, a building in New Orleans in which the transfer of Louisiana Territory from France to the United States was made. See LOUISIANA PURCHASE; NEW ORLEANS.

CABINET, a term generally applied in modern usage to the group of officials, called *ministers*, or *secretaries*, who are heads of the important departments through which the government of a country is carried on, and who form an advisory body to the chief executive, who may be termed President or Premier.

The Cabinet of the President of the United States. The President is sole head of the Executive branch of the government, which is divided into ten departments that have been created from time to time by act of Congress. The heads of these departments constitute the President's Cabinet. Though the word *Cabinet* is not mentioned in the Consti-

tution, the establishment of the various subordinate departments is implied in the clause which states that the President may "require the opinion, in writing, of the principal officer in each of the Executive departments, upon any subject relating to the duties of their respective offices" (see Art. II, Sec. 2, Clause 1).

In accordance with authority vested in it, the first session of the First Congress established, in 1789, the departments of State (at first called Foreign Affairs), of the Treasury, and of War (which then included both military and naval affairs). The secretaries of these departments, and the Attorney-General, who was then an official of the Judicial Department of the government, comprised Washington's first Cabinet. The Attorney-General became a Cabinet official in 1814.

The Postoffice Department was organized in 1794, but the Postmaster-General was not included among the Cabinet officials until 1820. The Department of War having been divided in the meantime, the Secretary of the Navy was created a Cabinet officer in 1798. In 1840 the Department of the Interior was established, in 1880 the Department of Agriculture, and in 1903 the Department of Commerce and Labor. This latter department was divided by act of Congress in 1913, part of it forming a new department, that of Labor. Each of these ten departments is described under its appropriate title in these volumes.

The officers who comprise the Cabinet are appointed by the President, but their appointment must be confirmed by the Senate. They do not have seats in Congress, as do the ministers in England, but in addition to their responsibilities as heads of their respective departments, subject always to the overruling authority of the President, they act as advisers of the Chief Executive. The President and his Cabinet officers work together in close harmony, and there is a mutual interchange of advice and assistance. In 1886, by the Presidential Succession Law (which see), the heads of the Executive departments then in existence were made eligible to the Presidency. The greatest prestige is attached to the office of the Secretary of State, but all Cabinet members draw the same salary, \$15,000 per year.

The ten Cabinet posts and the official designations of the incumbents follow:

- Department of State—Secretary of State
- Department of the Treasury—Secretary of the Treasury
- Department of War—Secretary of War.
- Department of Justice—Attorney-General.
- Postoffice Department—Postmaster-General.
- Department of the Navy—Secretary of the Navy.
- Department of the Interior—Secretary of the Interior.
- Department of Agriculture—Secretary of Agriculture

Department of Commerce—Secretary of Commerce.

Department of Labor—Secretary of Labor.

In the Dominion of Canada. The Cabinet of the Dominion of Canada is treated in full in the article CANADA, under the subtitle *Dominion Government*.

The British Cabinet. As now organized, the British Cabinet is composed of a group of men who fill the highest Executive offices in the government, and who act as a unit in directing its affairs. They serve as advisers to the sovereign, are responsible for all of his acts, and as Cabinet members become a committee of the Privy Council. The Cabinet has come to have the character of an executive committee for the party in power, and the members resign from office when that party is defeated.

The official head of the Cabinet is the Prime Minister. The Cabinet officers are appointed by the Crown, on the recommendation of the Prime Minister. He himself may hold one or more of these offices, and like the other members of the Cabinet, he has a seat in one of the houses of Parliament.

The number of Cabinet officials varies, but the following list is typical: Prime Minister and First Lord of the Treasury; Lord Privy Seal and Leader of the House of Lords; Lord President of the Council, Lord High Chancellor; Chancellor of the Exchequer, Secretaries of State for Home Affairs, Foreign Affairs, Dominions, Colonies, War, India, Scotland, and Air; First Lord of the Admiralty; President Board of Trade; Minister of Health; President Board of Education; Minister of Agriculture and Fisheries; Minister of Labour; Attorney-General; First Commissioner of Works; Chancellor of the Duchy of Lancaster. The recognition of the self-governing Dominions made necessary the creation of a Secretary of State for the Dominions. E.D.F.

Related Subjects. The reader is referred in these volumes to the following articles

Constitution of the United States	Presidential Succession
President	Law
	Privy Council

CABLE, GEORGE WASHINGTON (1844-1925), one of the best known of the Southern group of American novelists, whose most popular stories give a remarkable picture of the life and scenery of Louisiana. He was born in New Orleans, began to earn his own living at the age of fourteen, and five years later enlisted in the Confederate army. After the war he joined the staff of the New Orleans *Picayune*, and under the pen name of "Drop Shot," became known as a writer of humorous sketches and poems. In 1879 he was writing for *Scribner's Magazine*, and about the same time published *Old Creole Days*, the first of a series of books on which his fame rests. After 1886 he made his home in Northampton, Mass., where

he founded the Northampton Institute, devoted to the education of wage-earners.

Estimate of His Work. Cable excelled in descriptions of the rivers, swamps, and forests of Louisiana, and it has been said that he "knew every mood and whim of the wilderness on the gulf and river." His *Bonaventure*, *Strong Hearts*, and *The Grandissimes* reveal his skill in picturing scenes of river and forest life; *Dr. Sevier*, *Posson Jones*, and *Old Creole Days* are notable for their vivid descriptions of the life and picturesque beauty of the Old French quarter in New Orleans. His stories have the fault of over-emphasizing the weaknesses of the Creoles, and the author was greater as an artist than as an historian of social conditions. To him, however, American readers owe the interpretation of a phase of Southern life that is little known, and his pen has perpetuated for them scenes of beauty in French New Orleans that are fast disappearing. His other writings include *The Negro Question*; *John March, Southerner*; *Bylow Hill*; *Kincaid's Battery*; *Gideon's Band*; *The Amateur Garden*, and *Lovers of Louisiana*.



GEORGE W. CABLE

CABLE, SUBMARINE. When you read in your morning newspaper about something that happened across the ocean or on the other side of the world only a few hours earlier, do you ever realize that the telegraph under the sea, which brought the news, is one of the greatest wonders of this wonderful age? Your great-grandfather probably did, for in his early days, weeks or months were necessary for messages to come from beyond the seas. Of course, wireless telegraphy and wireless telephony are even more remarkable, but it is not probable that they made greater changes in the world than those the cable brought about. Nor is it likely that they will entirely supplant the cable, for wireless systems often are out of commission during electric storms, while the telegraph beneath the ocean never fails.

In 1864 a New York merchant wishing to buy or sell in London had to wait twenty days or more for an answer to each of his letters. A year later only a few hours were required to exchange cable messages. Thus the cable made possible an enormous trade between nations, and brought far-away lands like Australia into close touch with Europe and America.

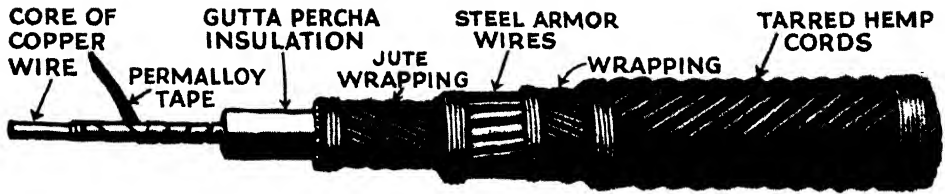
Cable Problems. To lay a continuous wire along the bottom of the ocean from continent to continent was by no means the only task of the men who gave the world the first cable. The electrical resistance in a wire 2,500 miles

long is enormous. (If the reader is not familiar with the meaning of such words as *resistance*, he should refer to the article **ELECTRICITY**.) But a strong current in a cable is apt to burn the insulation and render the whole length useless, so the current actually employed is so weak that ordinary telegraph instruments cannot be operated by it. A still greater difficulty was found in the fact that the outer coat of protecting wires shown in the illustration makes the cable an electrical condenser (an explanation of which will be found in the article **LEYDEN JAR**), and stores electricity which resists the passage of the message-carrying current. Thus the first Atlantic cable, completed in 1858, required over an hour to transmit a message of ninety words from Queen Victoria to President Buchanan, and after a few weeks was disabled, presumably by too great strength of current. The illustration explains in detail the construction of the cable now in use.

Instruments. The first man successful in devising a receiver sensitive enough to be operated by the feeble current of the cable was Lord Kelvin. This instrument was the *reflecting galvanometer*. A concave mirror about half the size of a ten-cent piece was hung by a silk thread fastened to a brass ring above and below. A magnetic needle attached to the back of the mirror turned it back and forth, according to the direction of the current in two coils of insulated copper wire, and the direction of this current was controlled by the telegraph key of the operator on the other side of the ocean. The mirror reflected a spot of light on a scale three feet away; if the spot was moved to one side, a dot was indicated; if to the other, a dash (see the article **TELEGRAPH**, for an explanation of the Morse alphabet).

Lord Kelvin later invented the *siphon recorder*, which in 1867 displaced the mirror instrument. The siphon is a small glass tube with its upper end in ink and its lower end upon a strip of paper which passes slowly along while the message is being received. Like the mirror of the older apparatus, the siphon is moved to the right or left by the magnetism of the current, but with a greater degree of accuracy. But because the magnetic action would not be strong enough actually to drag the inked point back and forth on the paper, the siphon is rapidly vibrated up and down by an independent magnet, exactly in the manner of the hammer of an electric bell.

So many improvements have been made in the apparatus of submarine telegraphy that messages are now sent at the rate of 200 or more words a minute. An early change of importance was the addition of a large tinfoil condenser, which is connected to the receiving

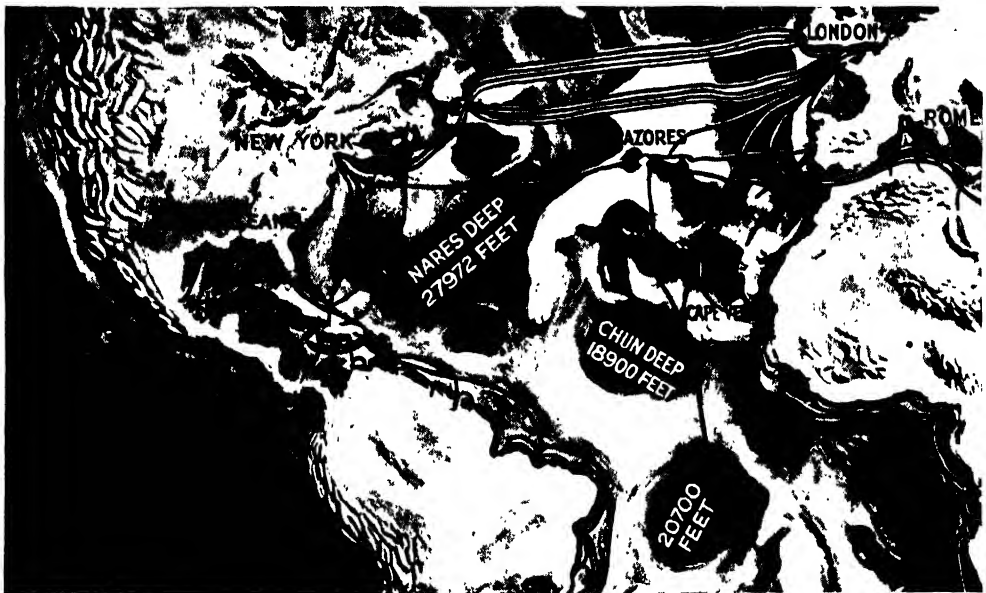


PARTS OF THE MOST MODERN CABLE

Construction of the new high-speed permalloy cable, across which messages rush at the rate of 1,500 letters each minute. The secret of this speed is the thin layer of permalloy tape, which keeps signals from jumbling.

instruments and to the ground, and helps to overcome the condensing effect of the cable itself. By the use of a magnifier the received signals can be increased in size, and the speed of transmission may be increased about thirty per cent. On a long cable a relay, or repeater, instrument may be used in conjunction with

apparatus is installed. The receiving device produces an exact duplicate of the original tape. In turn, the tape is run through a printer which types out the message. Since signals received from a long cable are somewhat distorted, the automatic receiving perforators insure greater accuracy; furthermore, this

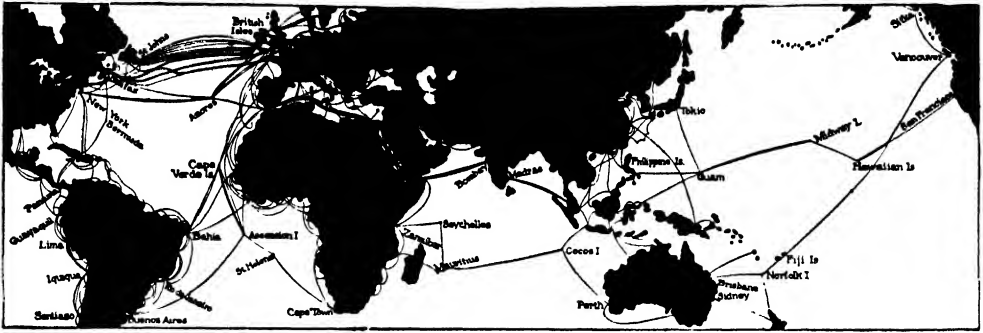


GENERAL VIEW OF THE DEPTHS OF THE ATLANTIC OCEAN

Hundreds of deep-sea soundings have given men a fairly definite idea of the topography of the ocean floor. Before cables are laid, the proposed routes must be surveyed with almost as much accuracy as is required in building a railroad. These elaborate surveys show that the bottom of the Atlantic is a succession of high hills, deep valleys, and wide plateaus.

a magnifier. The automatic transmitter greatly increases accuracy as well as speed. When a message is sent by this method, the operator prepares it by writing it upon a perforating machine which has a keyboard similar to that of a typewriter. The perforated strip is run through a transmitter, and by means of electric impulses is received at the various stations along the route where the automatic receiving

method of tape-translation allows a direct linking up of a greater number of cables, thus decreasing the total delay. Another valuable invention is one which makes it possible to transmit messages in both directions at the same time, as in the *duplex telegraph*. The newest and most promising improvements in the submarine cable are the permalloy type, which practically eliminates distortion of sig-



PRINCIPAL OCEAN CABLES

nals, and the continuous loading type, which has a higher rate of speed than any automatic receiving apparatus available.

Cost of Messages. Though charges for cable service are less than formerly, they are still much higher than for land telegrams. Because of the great cost, it is customary to send them in codes in which a single word may be made to stand for an entire sentence. Recently some of the companies have introduced several varieties of reduced rate messages, which, like telegraph night letters, are designed to keep the lines busy during hours when they would otherwise be idle. Thus a message from New York to London, which the company may deliver at any time within twenty-four hours, costs but half the regular amount; special rates have also been granted for a letter, not in cipher, to be delivered within twenty-four hours, and for a *week-end* letter, sent Saturday for delivery Monday.

The Atlantic Cable. No incident in history gives greater evidence of the power of perseverance than the story of the laying of the first Atlantic cable. When Cyrus W. Field, in 1854, first became interested in the project, the longest cable in operation was between shores less than 100 miles apart. Engineers of the United States navy, particularly Matthew Fontaine Maury (which see), had previously discovered that the ocean bed between Newfoundland and Ireland was nearly level and composed of soft mud, apparently an ideal resting place for the delicate strand which might link the Old World to the New, but many prominent scientists declared it impossible to lay a cable over two thousand miles long, or to operate it if laid.

Field's first attempt to lay a short cable from Canada to Newfoundland, in 1855, was a failure, but he succeeded in this part of his task the next year. Then followed nine years of discouragement, brightened only by the temporary success of the cable of 1858, which was laid by the British warship *Agamemnon* and the United States warship *Niagara*, after two cables had broken in mid-ocean. When the

cable failed after only a few weeks' service, the opposition to Field increased, but again he set about his task of raising capital for the enterprise. The *Great Eastern*, then the largest ship afloat, was chartered in 1865, and after losing a thousand miles of cable on its first trial, succeeded in putting in place two cables which permanently joined the two countries, and proved the soundness of Field's ideas. Since then many other cables have been added to these pioneers, as the accompanying map shows.

In 1925 the Western Union Telegraph Company laid the world's newest and greatest cable, providing direct connection between New York and Italy. This amazingly efficient cable transmits signals at the speed of 1,500 letters a minute, five times as fast as any in operation up to that time. The increase in efficiency was chiefly made possible by the use of a new metal, permalloy (which see).

The Pacific Cables. Not until 1902 was there direct cable connection between the two shores of the Pacific Ocean. In that year Canada, Australia, and New Zealand were joined. The total length of the cable is nearly 8,000 miles, but it is divided into several sections, touching at the Fiji Islands and other less important places. In 1903 a second Pacific cable was put in operation between San Francisco, the Hawaiian Islands, and Manila; branches of it have since been extended to Japan and the East Indies. In some of the depths of the Pacific, cable-layers found the waters to be six miles deep.

Cutting Cables in War. International law recognizes the right of a nation at war to cut the cables belonging to its enemies, but most nations agree that neutral cables should not be harmed. A cable connecting a neutral country with the enemy may be cut within territory occupied by the enemy, but some authorities maintain that it should not be cut in the open sea. The United States cut the British cable at Manila in 1898, when Dewey's fleet fought the Battle of Manila Bay, but denied responsibility for damages.

During the World War, the allies cut all of the Atlantic cables to Germany.

Related Subjects. The reader is referred in these volumes to the following articles

Field (Cyrus West)	Permalloy
Kelvin, William Thompson	Radio Communication
Maury, Matthew Fontaine	Telegraph

CABOT, kab' ut, JOHN (1450-1498) and SEBASTIAN (1476-1557), two well-known navigators, father and son, whose names are prominently connected with the discovery of the continent of North America. They were natives of Italy, but when Columbus made his voyage to the New World, they were living at the port of Bristol, England. The wonderful information carried back to Europe by Columbus inspired them to seek a shorter route to the Spice Islands of the East Indies, which they expected to reach by sailing westward on a course that lay to the north of the route followed by Columbus.



JOHN CABOT

John Cabot headed the expedition, for which King Henry VII granted the letters of authority, and it is probable, though not certain, that Sebastian accompanied him. The ship, very similar to the boats used by Columbus, sailed in May, 1497, and on June 24 of the same year Cabot landed on the North American coast in the neighborhood of Cape Breton. He claimed the land for the king of England, convinced that it was a part of Asia. This discovery approaches in importance the great achievement of Columbus in 1492, for the Cabot voyage of 1497 gave England its claim to the mainland of North America, and prepared the way for a long period of exploration and the founding of the English colonies in the New World. See CANADA (History).

In 1498, John Cabot, possibly accompanied by his son, made a second voyage westward in the attempt to find a shorter route to the East, sailing up the west coast of Greenland until he was blocked by icebergs and passing over Davis Strait to the modern Baffin Land (see NORTHWEST PASSAGE). His homeward route led him as far south as North Carolina. He died shortly after his return to England. Sebastian Cabot was for several years in the service of the Spanish king, and visited Brazil and the River La Plata in 1525. Later, he was appointed chief pilot for England, and in 1554 became governor of the Company of Merchant

Adventurers which obtained for England an important trade with Russia.

CABOT STRAIT. See SAINT LAWRENCE, GULF OF.

CABRAL, kah brahl', PEDRO ALVAREZ (1460-1526), a Portuguese navigator whose fame rests on one voyage. He landed in what is now Brazil during the winter of 1500-1501, and took possession in the name of the king of Portugal. He had sailed for India by way of the Cape of Good Hope, but was driven from his course by adverse winds and the equatorial current. A Spaniard had reached this coast earlier in the year, and had taken possession for his country, but Spain could not make good its claim, because according to the line of demarcation, the new territory fell within Portuguese limits. Cabral finally reached India, where he made important commercial treaties with native princes. For the immediate effects of Cabral's enterprise, see BRAZIL (History); DEMARCATION, LINE OF, with map.

CABRILLO, kah bree'l' yoh, a Spanish explorer. See CALIFORNIA (History).

CABRILLO MONUMENT. See MONUMENTS, NATIONAL.

CACAO, ka ka' o, the tree from the seeds of which are prepared cocoa and chocolate. It grows almost everywhere in warm countries, although it is a native of tropical America only. There is some confusion in the use of the word *cocoa*, for that name is applied to the palm from which we obtain coconuts and coco butter. However, the preferable spelling for the name of this palm is *coco* (see COCONUT). For a discussion of the important products of the cacao, see COCOA and CHOCOLATE. G.M.S.

Scientific Name. The scientific name of the cacao is *Theobroma cacao*, and it belongs to the family *Sterculiaceae*.

CACHE, kash, RIVER. See ARKANSAS (Rivers and Lakes).

CACIQUE, ka seck', village chief in Spanish colonial times. See PHILIPPINE ISLANDS (History: Spanish Days).

CACTUS, kak' tus, the common name of a family of plants especially adapted to an existence in arid regions, but growing in part in tropical forests. To prevent the loss of moisture by evaporation, the leaves in the more familiar forms have practically disappeared, and the green stems take over the function of the leaves, that of food-making. Their fleshy stems also contain a large amount of tissue adapted to the storage of water. The different kinds of barrel cactus in the Southwestern states and in Mexico are notable examples of this adaptation. By slicing the top from a large barrel cactus and mashing the pulp, one person got as much as three quarts of drinkable water from it. The fleshy parts

of this cactus are used in making cactus candy.

Most of the cacti are equipped with stiff, spiny prickles and long thorns. With the exception of one small group, the cacti are all natives of North and South America, but some species have been introduced by man into the Old World and have become thoroughly established there. Certain members of the spurge family in Africa have the same strange forms that we see among the true cacti. In the United States, cacti are most abundant in the arid Southwest. About 1,000 species have been described.

Typical Species. Cacti vary greatly in form and size. The largest species is the *giant cactus*, belonging to the genus *Carnegiea*. Forests of this remarkable plant grow in the drainage basin of the Gulf of California, and the huge columnlike stems sometimes reach heights of thirty to forty feet. This cactus is the state flower of Arizona. Many striking hothouse plants are members of the *Cereus* group. Among these is the *night-blooming cereus*, whose large, fragrant white flowers open at midnight. Species of *Pilocereus* also are found in greenhouses, and are interesting because they have abundant growths of white hairs instead of spines. This peculiarity has given them the name "*old-man*" cactus.

About 150 species belong to the genus *Neomamillaria*. These cacti are globular or ovoid in shape, and are covered with spine-bearing tubercles. Species of *Echinocactus* and other groups are similar in shape, but are strongly ribbed. The most useful cactus, the edible *prickly pear* (which see), belongs to *Opuntia*. This plant has been naturalized in the countries bordering on the Mediterranean Sea under the name of the *Indian fig*, and it is a popular food product there.

Another species of *Opuntia* is cultivated in Mexico to feed the cochineal, an insect whose body is the source of a coloring matter (see COCHINEAL).

Lophophora williamsii, a small cushion-like cactus from Northern Mexico and Texas, called *peyote*, contains a powerful narcotic, and has been used by the Indians in their religious ceremonials.

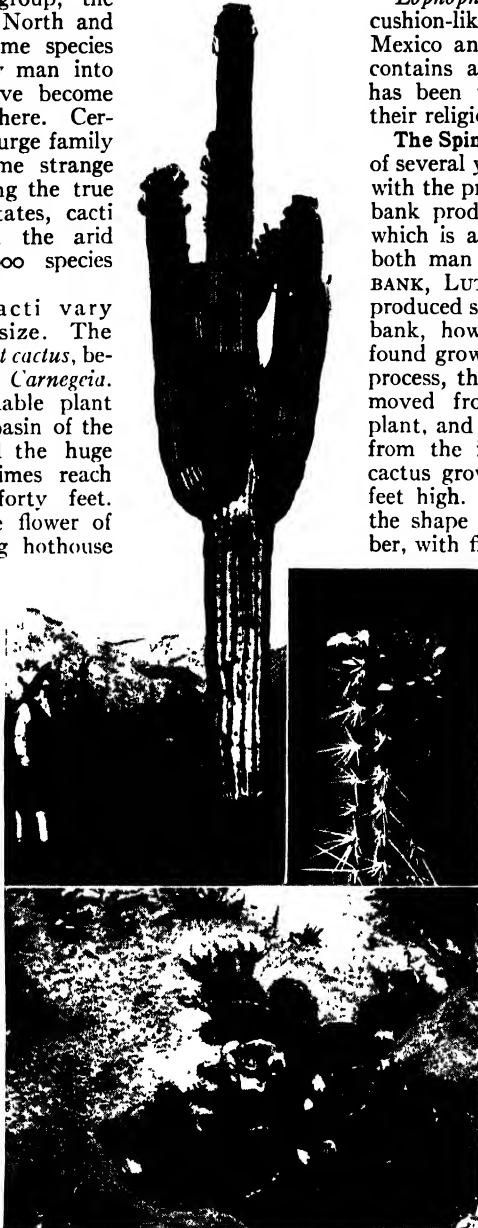
The Spineless Cactus. As a result of several years of experimentation with the prickly pear, Luther Burbank produced a spineless cactus which is a valuable food plant for both man and animals (see BURBANK, LUTHER). Nature herself produced spineless cacti before Burbank, however. They are often found growing wild. In Burbank's process, the spines were wholly removed from the outside of the plant, and most of the woody fiber from the interior. The spineless cactus grows from eight to sixteen feet high. Its fruit has somewhat the shape of a short, thick cucumber, with flat ends, and it is about

two to three inches in diameter. The colors of the fruit are crimson, orange, yellow, purple, and white, and its flavors are as numerous as those of the apple. It may be eaten raw, or made into jams, jellies, and syrups. The slabs or stems of the spineless cactus are an excellent stock food, and are estimated to possess about one-half the nutritive value of alfalfa. The joints of the plants make excellent pickles.

Six months after planting, some varieties of the cactus in fairly good soil will produce seventy-five tons of forage to the acre; after the second or third year, they will sometimes produce as much as 150 tons to the acre. A cactus leaf ten inches across will sometimes produce

thirty to forty full-sized cactus pears. G.M.S.

Scientific Names. The scientific name of the cactus family is *Cactaceae*. The giant cactus is *Carnegiea*



Photos U. S. Visual Education Service

Above, the giant cactus of the desert; at right, a South American cactus in bloom; below, prickly pear cactus.

gigantea; the most common night-blooming cereus is *Hylocereus undulatus*; the prickly pear is *Opuntia vulgaris*; *Nopalea coccinellifera* is one of the species that



Photo P & A

NIGHT-BLOOMING CERFUS

This plant, owned in Delaware, was more than twenty-five years old when the photograph was taken on its night of blooming.

serve as food for the cochineal, the barrel cactus is known as *Ferocactus*.

CADDON, *kad' o an*, a linguistic Indian family. See INDIANS, AMERICAN (Families or Confederacies).

CADET, a term applied to pupils studying at naval and military colleges. An officer of non-commissioned rank in the United States navy was formerly called a cadet, but the term *midshipman* has now supplanted it. Military cadets are trained in the United States at West Point and in many private military academies, at Sandhurst and Woolwich in England, and at Kingston, Ontario, in Canada. See MILITARY ACADEMY; NAVAL ACADEMY.

Some Origins. Originally the term was applied to the younger son of a noble house, as distinguished from the elder son. The modern words *caddie*, applied to one who carries golf clubs for a player, and *cad*, name of an offensive or vulgar person, are derived from the word *cadet*.

CADILLAC, *kad e yak'*, ANTOINE DE LA MOTHE (1660-1720), a French nobleman, an explorer in America, and founder of Detroit, Mich. He served as a captain in Acadia (now Nova Scotia) till recalled to France by Louis XIV, who wanted information about the French colonies, their harbors and their defenses. When he returned to New France, he was made commander of Michilimackinac (now Mackinac, Mich.), the second important post in Canada. In 1699 he again went to France to obtain Louis' support in founding a settlement which would become the commercial center of the Northwest.

Louis favored the plan and promised him 200 settlers and six companies of soldiers. Because of the jealousy of Canadian officials, however, when Cadillac arrived in Montreal he was able to get only fifty settlers and fifty soldiers. He selected the present site of Detroit as the place to establish a town and landed there in June, 1701, with his small company. Six years later, he brought the Miami Indians to terms, and founded a post among them in Alabama. When Louis made him governor of Louisiana, he punished the Natchez tribe and built a fort in their country and one at Natchitoches as an outpost against the Spaniards. In 1717 the government and trade of Louisiana passed to John Law's Western Company, and Cadillac returned to France, where three years later he died.

CADILLAC, MICH. See MICHIGAN (back of map).

CADIZ, *ka' diz*. See SPAIN (Principal Cities).

CADMUS, *kad' mus*, a Greek hero to whom legend gave the honor of having introduced the Phoenician alphabet into Greece. His name has been made proverbial through the familiar—

"May blessings be upon the head of Cadmus, the Phoenicians, or whoever it was that first invented books."

He was the son of Agenor, king of Phoenicia, and the brother of Europa (which see).

In the mythological story, when his sister was carried off by Jupiter in the form of a bull, Cadmus was directed by his father to hunt for her and not to return without her. With his brothers, he set forth on the long quest. One by one the brothers became tired and stopped by the wayside, but Cadmus kept on until told by an oracle that his search was useless. This oracle also directed him to follow a cow which he should shortly meet; and where she should lie down there he was to found a city. He carried out these instructions, and the city which he founded was Thebes, in Boeotia. After killing a dragon which guarded a fountain near the site of his proposed city, Cadmus sowed the teeth of the dragon, and there sprang up a group of armed men. These men contended with one another until all but five of them fell, and these five became, with Cadmus, the first inhabitants of the new city. See THEBES.

CADUCEUS, *ka du' se us*. See MERCURY (Mythology).

CAECUM, *se' kum*, in physiology. See illustration, in article ALIMENTARY CANAL; see, also, APPENDICITIS; INTESTINE.

CAEDMON, *kad' mun*, a poet of early England, sometimes called the "Anglo-Saxon Milton." He lived in the latter half of the seventh century, and in his early years toiled as a laborer on the abbey lands at Whitby. What

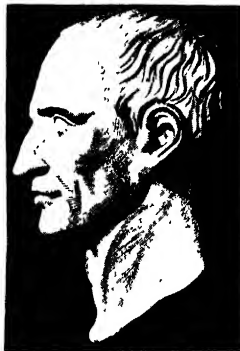
is known of his life is derived from the *Ecclasiastical History* of the Venerable Bede, in which it is told that a vision appeared to Caedmon one night commanding that he sing the praises of God. Thereupon, he began to sing verses, the words of which he had never heard before. After he awakened, he remembered the words he had sung, and added others to them. When the Abbess Hilda, of the monastery at Whitby, learned of his gift, he was admitted into the abbey and made one of the brethren.

Supposed Authorship. Several Anglo-Saxon poems are attributed to him, but critics doubt that he was the author of all of them. The most important of these is the so-called *Paraphrase*, giving the story of *Genesis*, *Exodus*, and a part of *Daniel*. Many passages in this remarkable specimen of Old English literature suggest strongly the poetry of Milton.

CAESAR, se' z'r, a title of highest political authority, originally the family name of the first five Roman emperors. So great was the fame of Caius Julius Caesar (which see) that after the death of Nero, the last of that imperial family, the name was adopted by succeeding Roman emperors as a kingly title. This practice continued, and the title was Germanized as *kaiser* and Russianized as *czar* (see both titles).

CAESAR, CAIUS JULIUS (100-44 B.C.). This greatest of the Romans, who "moved through life calm and irresistible, like a force of nature," was born of a patrician family, but early showed that his sympathies were strongly in favor of democracy. This does not mean that he believed in government "of the people, by the people, and for the people"; the time in which he lived made that impossible; but he held firmly to the principle of extending Roman citizen rights to the provincial subjects and to the overthrow of aristocratic privilege.

His marriage at the age of seventeen with Cornelia, daughter of the democratic leader Cinna, strengthened his sympathies, and because he refused to divorce her at the command of the aristocrat, Sulla, he was forced to flee from Rome and give up all his property. On Sulla's death he returned, and though he left again to study eloquence at Rhodes, he was from that time increasingly interested in public affairs, always taking the part of the people.



But yesterday the word of Caesar might have stood against the world.

—SHAKESPEARE.

The halftone is from a bust in the British Museum.

His marriage with Pompeia, a young woman of high social connections who became his second wife in 67 B.C., combined with his personal talents to win him popularity in Rome; and his attempts to confer citizenship on the Latins beyond the Po secured him the sympathies of the Italians. He was elected to various offices, and in all of them won added favor by lavish expenditures and splendid public games.

Connection with Pompey. Though the conspiracy of Catiline brought discredit on all the popular party, including Caesar, his political prospects were not really injured. After a year spent as *propraetor* (governor) in Spain, he returned to Rome and formed a coalition with Crassus, a man of enormous wealth and great political ambition, and with Gnaeus Pompey, who had returned from Asia Minor two years before as the great military leader of the day and the idol of the people. Thus was formed the First Triumvirate—not as an organized form of government, but simply as a union to promote the interests of its three members. Through the support which he thus gained, Caesar was elected consul for 59 B.C. and received the command of the province of Gaul for a term of five years, later extended to ten years.

Gaulic Campaigns. It was almost an accident that Caesar became a soldier; he was by nature and training a politician rather than a general. But when, in 58 B.C., he went as proconsul to Gaul, it soon became evident that he was a military genius of high order. His courage knew no bounds, and his generalship was so great that in all his nine years in Gaul he only twice lost battles at which he was present in person. He was adored by his soldiers as perhaps no other man has ever been. In his nine campaigns he reduced the whole province to subjection, and at one time bridged the Rhine that he might pursue the invading Germans whom he had driven back. His campaigns against the Helvetii, the Belgae, and the Germans won him immense popularity at Rome, where public thanksgivings were decreed in his honor. Twice during his years in Gaul, in 55 and in 54 B.C., he invaded Britain, but his victories there were little more than nominal, as he left no troops to hold the island.

Civil War. Meanwhile, not everyone at Rome was rejoicing over Caesar's victories; Pompey was becoming ever more jealous and inclining more and more to the aristocratic, or senatorial, party. In 49 B.C. he procured the passage of a decree ordering the disbanding of Caesar's army, but the victorious commander was not prepared to submit, and with his legions crossed the Rubicon—the little stream which separated his provinces of Gaul from Italy. This was virtually a declaration of war, from which there was no turning back; and to this day when an act is based on a momentous

decision, it is said the person has "crossed the Rubicon." Little bloodshed was necessary in Caesar's advance upon Rome, for the people everywhere welcomed him, and Pompey, with the Senate and nobles, fled to Greece.

Having made himself in less than three months master of all Italy, Caesar hastened to Spain to overthrow Pompey's legates there. On his return from this expedition, he was appointed dictator, an office which he held but eleven days. In January, he followed Pompey into Greece and defeated him on the plains of Pharsalia, August 9, 48 B.C. When the news of this victory reached Rome, Caesar was appointed dictator for one year, consul for five, and tribune for life.

At the Height of His Power. Before returning to Rome, Caesar brought to a successful conclusion the war which had been undertaken in order to place Cleopatra on the throne of Egypt, and proved himself not strong enough to resist the charms of the queen who a few years later played so disastrously with the life of Antony. Returning through Pontus, he defeated Pharnaces and informed the Senate of his victory in the laconic dispatch, "*Veni, vidi, vici*" (I came, I saw, I conquered). He defeated the remaining forces of the party of Pompey at Thapsus, in Northern Africa, and Cato killed himself at Utica rather than fall into the hands of this universal conqueror. Now undisputed master of the Roman world, Caesar showed his greatness and magnanimity by pardoning the followers of Pompey. The dictatorship was bestowed upon him for ten years by a grateful people, and his victories were celebrated by magnificent triumphs.

New Jealousies. After his return from defeating the two sons of Pompey in Spain, in the year 45 B.C., fresh honors were conferred upon him. He was made *imperator* for life, and his portrait was stamped upon the coins of the realm. In the correction of the calendar, which had fallen into great confusion, he performed an important service, and he proposed many public improvements, such as founding public libraries, draining the marshes, enlarging the harbor at Ostia, and digging a canal across the Isthmus of Corinth. None of these designs, however, was he allowed to carry out, for the aristocrats were still suspicious of him, fearing that he meant to make himself king. At a public festival, indeed, a crown was offered him by Mark Antony, but he refused it—unwillingly, if the reports of historians are to be believed. Antony made reference to this in his masterly funeral oration over Caesar, in the words, according to Shakespeare—

You all did see that on the Lupercal
I thrice presented him a kingly crown,
Which he did thrice refuse: was this ambition?
Yet Brutus says he was ambitious;
And, sure, he is an honourable man

I speak not to disprove what Brutus spoke,
But here I am to speak what I do know.

The people had greeted this renunciation with the wildest enthusiasm, but the suspicions of the aristocrats were not quieted, and a plot was formed to kill him.

On March 15, in the year 44 B.C., he was assassinated, receiving over a score of wounds from the daggers of men who had accepted favors at his hands and whom he had believed his friends. Shakespeare in his *Julius Caesar*



Photo: Visual Education Service

CROSSING THE RUBICON

When he arrived at the banks of the Rubicon, which divides Cisalpine Gaul from the rest of Italy . . . he stopped to deliberate. . . . At last he cried out: "The die is cast," and immediately passed the river.

--PLUTARCH: *Life of Julius Caesar*.

has made the whole story of the conspiracy and murder as familiar as something that happened yesterday, and has described, too, the immediate political result of Caesar's death. The succeeding years showed well how great a disaster it really was to the state, and proved that only under the beneficent rule of a wise man could Rome really prosper.

The Judgment of Time. Any man so outstanding among the men of his own time and of succeeding centuries is certain to be the center of heated argument, and Caesar is no exception to this rule. In his case, however, the disagreement has been almost entirely about his political system, which to some appears as a despotism of the worst type, to others a view of empire remarkable for the age in which it was conceived. Almost all historians agree in praising Caesar's kindness and generosity toward his enemies; his marvelous power of mind which made it possible for him to give apparently undivided attention to half a dozen matters at the same time; and his irresistible charm of personality. Much of the



From the painting by Gerome

THE DEATH OF CAESAR

And, in his mantle muffling up his face,
Even at the base of Pompey's statue * * * great Caesar fell

—From oration of Mark Antony over the body of Caesar.

knowledge of him which has come down to later times is derived from Plutarch's *Lives*, in which Caesar is compared with Alexander the Great; but the Greek historian, according to modern historic judgment, does not always do justice to the most original genius Rome ever produced.

As an orator, Caesar ranked second only to Cicero. Nor were his abilities as an historian less noteworthy; for his *Commentaries on the Gallic War*, known to every student of Latin, is used everywhere as a textbook, not only because it is written in Latin, but also for the reason that it presents, in simple and vigorous style, a straightforward account of events, and is therefore a model of historic writing. B.M.W.

Related Subjects. The following articles in these volumes will throw further light upon the story of Caesar or the history of the times in which he lived:

Antony, Mark	Germany (History)
Brutus, Marcus Junius	Gaul
Calendar	Helvetii
Catiline	Imperator
Cleopatra	Pompey
Crassus, Marcus Licinius	Rome (History)
England (History)	Rubicon
France (History)	Sulla, Lucius Cornelius

Triumvirate

CAESAR'S HEAD. See SOUTH CAROLINA (The Land).

CAFFEINE, *kaf' e in*, OR **THEINE**, *the' in*, an important alkaloid whose presence in tea and coffee gives them their stimulating properties (see ALKALOIDS). Caffeine is an odorless, slightly bitter solid which crystallizes in slender, silklike needles. It is soluble in water and alcohol. Tea contains from one to four per

cent of caffeine, and coffee from one to two per cent. When taken in moderate quantities, it has the stimulating effect of increasing the circulation and arousing one to a greater degree of activity; this is declared by many to be a harmless and gently stimulating effect. When taken in too large quantities, however, it causes nervousness, insomnia, rise of temperature, and paralysis of heart action. The person who drinks coffee or tea to excess is apt to suffer from nervous disorders.

Caffeine is not a poison, and is regarded by physicians as a valuable drug when properly administered. It is used as a stimulant to the nervous system in cases of depression, to improve the heart action in cases of exhaustion, as a remedy for opium and alcohol poisoning, and to increase the activity of the kidneys when those organs are not functioning normally. See COFFEE; MATÉ.

[Caffeine is a compound of carbon, hydrogen, nitrogen, and oxygen. It is administered as coffee, in powdered form, and in capsules; when mixed with sodium benzoate in solution, it is given hypodermically.]

CAGLIARI, *kal yah' re*, the capital of Sardinia (which see).

CAGLIOSTRO, *kal yaws' tro*, an impostor who claimed ability to make gold. See AL-CHEMY.

CAHABA, *ka haw' bah*, first capital of Alabama. See ALABAMA.

CAIN, *kane*, the first man in the Bible to kill another human being, was the eldest son of Adam and Eve. Cain was a tiller of the

soil, and Abel, his brother, was a keeper of the sheep. In due time, each offered sacrifice to the Lord. Cain offered the fruit of the ground, and Abel the firstlings of his flock. "The Lord had respect unto Abel and his offering, but unto Cain and to his offering he had not respect." Cain was angry and killed Abel. As a punishment, the Lord pronounced a curse upon Cain and made him a wanderer in the earth. Cain feared that he would be slain, and the Lord placed a mark upon him and commanded that no man should harm him. (See *Genesis* IV.)

Related Subjects. The reader is referred in these volumes to the articles ADAM AND EVE, ABEL, EDEN, GARDEN OF

CAINE, [THOMAS HENRY] HALL (1853-), an English writer whose novels, rather melodramatic for the most part, have nevertheless a gloomy power which accounts in large measure for their popularity. Caine is of Manx descent—that is, his ancestors came from the Isle of Man; and he had the wisdom to lay the scenes of many of his novels in that little island in the Irish Sea which he knew so well. Caine was born at Runcorn, England, and was educated to be an architect, but he found journalism much more to his liking, and for six years was a leading writer on the *Liverpool Mercury*. In 1881 he went to London on the invitation of Rossetti, with whom he lived for a year, until the latter's death. His *Recollections of Rossetti* picture the poet during this last strange year of his life. Caine's first novel was published in 1885, and marked the beginning of his long and successful career as a writer of fiction. He has always been ardent in promoting British prestige, and for his services in the World War, especially in propaganda work, he was honored with the title Knight of the British Empire.

His Writings. Caine's numerous novels include *The Shadow of a Crime*, *The Decmster*, *The Bondman*, *The Manxman*, *The Christian*, *The Eternal City*, *The Prodigal Son*, *The White Prophet*, *The Woman Thou Gavest Me*, *The Master of Man*, and *The Woman of Knockaloe*. Many of these have been successfully dramatized. Caine also wrote plays, including *The Iron Hand* and *The Prime Minister*, and an autobiographical volume entitled *My Story*.

CAIRO, *ki' ro*, EGYPT. "Who hath not seen Cairo hath not seen the world," we read in an old Arabian book. This most populous city

of Africa, and the ancient capital of Egypt, is truly a bridge between two civilizations—a meeting place of the Western spirit of progress and the mysticism of the East.

The streets present a scene of picturesque and vivid coloring, and the ear is assailed by a babel of tongues. Among its inhabitants are Egyptians, Arabs, Nubians, negroes, Turks, and representatives of every race in Europe. Cairo might be appropriately called the *city of mosques*, but it received from its founder, Gohar, a general of the Fatimite Caliph, Al Moez, in 973, the name of El Kahira, which means the *victorious city*.

The site was well chosen. The city lies on the east bank of the Nile, 130 miles southeast of Alexandria, on the Mediterranean, and eighty-four miles west of Suez by the old caravan route across the desert. It is 5,340 miles from New York, direct through the Strait of Gibraltar, and 2,540 miles from London, and is in the same latitude as New Orleans, La. The city is divided primarily into two portions, eastern and western. These are again subdivided into quarters, each, in architecture, bearing the stamp of the race and tastes of its inhabitants.

The old portion of the city shows no trace of the advance of Western influences. Crooked, narrow, and dirty streets are lined by high stone houses with barred windows. Rearing their turrets and domes above the surrounding dirt and squalor are numerous mosques, some of which are strikingly beautiful and are considered fine examples of the best Arabian architecture. The Gami-ibn-Tulun, erected on what tradition says is the spot where God spoke with Moses, is a magnificent square building surmounted by four minarets and a profusely ornamented dome. The Gami Sultan Hasan, although comparatively modern, is an imposing building, considered one of the most beautiful of all the mosques of Cairo. As an educational center, Cairo ranks high among Eastern cities, its university, El-Azhar, meaning the *resplendent*, being the oldest in the world.

The modern portion of Cairo rivals European centers, with broad, well-lighted boulevards, streets lined by well-appointed stores and offices, and, in the center of the European colony, the famous Ezbekia Gardens, covering an area of over twenty acres. Near the Gardens are the government offices, both British and native, all the important modern buildings, and the palace of the king, the ruler of Egypt.

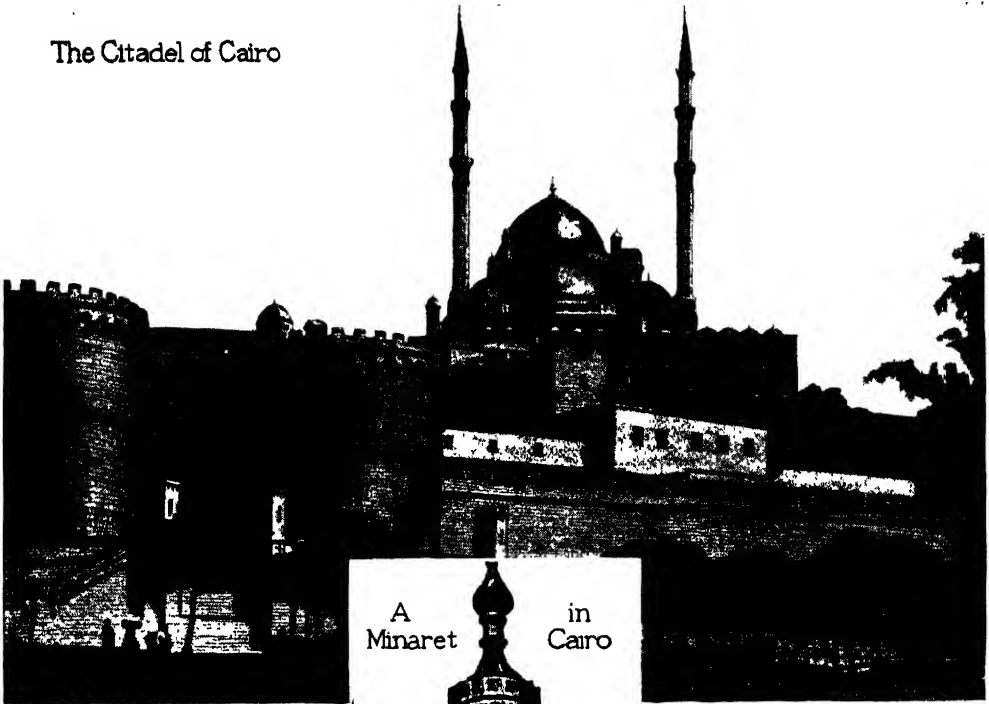
Although chiefly noted as a social center, sometimes called an Oriental Paris, Cairo is important as an industrial city. The chief manufactures are textiles, curios to sell to tourists, metal articles, gold and silver work, and essences of flowers. Its markets receive



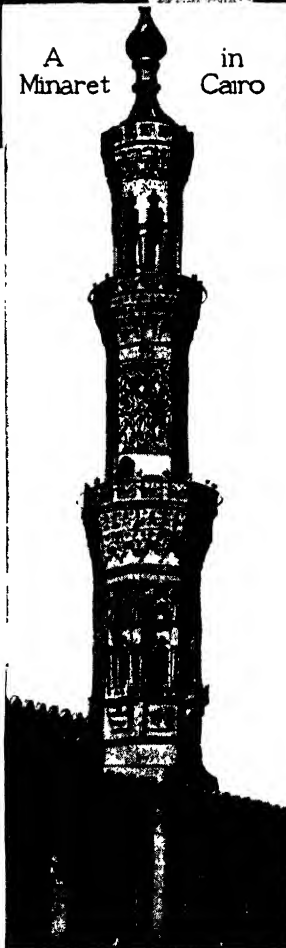
Photo: Brown Bros.

HALL CAINE

The Citadel of Cairo



A Minaret in Cairo



ostrich feathers, ivory, and hides from the Sudan, shawls from India, tobacco from Turkey; and it is a forwarding center for European manufactured goods.

Cairo was formerly an important slave market, but this traffic was suppressed in 1877. From 1798 to 1801, the city was held by the French. It was handed over to the Turks by the British in 1801, and Mehemet Ali seized the reins of government and established a dynasty. In 1915, with the rest of Egypt, Cairo was declared a British protectorate, but in 1921 the entire country was returned, with certain political reservations, to the native government. Cairo's population is 1,065,000. See EGYPT; MOSQUE; PROTECTORATE.

[A photographic view of Cairo is shown in the article AFRICA, page 81.]

CAIRO, *ka' ro*, ILL. See ILLINOIS (back of map).

CAISSON, *ka' s'n*, in civil engineering, a water-tight box or casing, used for several different purposes. It is usually constructed of sheet-iron, and so made that it can either be

floated or sunk in the water, as desired.

Its most general use is for building foundations for bridges, dams, or walls in the water. For this purpose the caisson is sometimes built so that it can be floated to the position where it is desired, and there sunk. A caisson to be used in this way is sometimes made with a wooden bottom which can be separated from the sides. Then, when the concrete for the structure is placed inside, the sides can be removed. In other cases, the caisson is constructed without a bottom, and the bottom edges are made so that they will cut into the earth. When the casing is thus sunk into the earth below the water, the water is pumped or forced out, and the earth is taken out by ingenious hoisting devices, the caisson sinking deeper as the work progresses.

For this kind of work, it is sometimes necessary to use what is termed a pneumatic caisson. First, a metal caisson open at one end and with sharp cutting edges is sunk into the water,



EXPOSED ENDS OF CONCRETE CAISSONS

These cylindrical foundations upon which the building will rest are sunk, sometimes more than 100 feet, to bedrock.

bottom side up. On this is placed another caisson open at the top, and in this the desired masonry is built, thus driving the lower caisson farther into the ground. After this is begun, compressed air is forced into the lower caisson

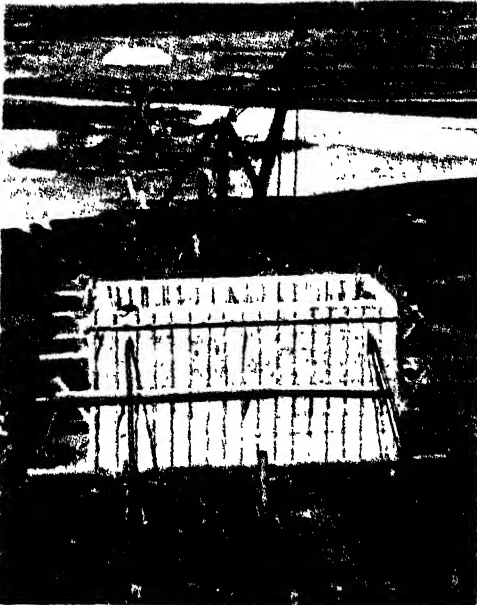
of the casing until the surface is reached on which it is desired to have the foundation rest. The conditions under which these men work are similar to those under which a diver works. The masonry above has grown as the hole below has grown deeper, and it finally rests on the rock bottom prepared for it. A similar use of the caisson is common in excavating tunnels under rivers. In this work, however, the caisson is driven horizontally. The great railway tunnels under the Detroit River at Detroit and those under the Hudson River at New York were excavated by this method. See TUNNEL.

In sinking foundations for very large buildings, a caisson open at both ends, the lower end with cutting edges, is forced into the earth. The caisson sinks lower as the earth inside is removed. When rock bottom is reached, the caisson is filled with concrete. In this manner a concrete pillar resting on solid rock is secured. Most of the "skyscrapers," or very tall buildings, rest upon foundations of this sort.

Caissons, of various forms and in various combinations, are used for raising ships out of the water, and also for floating docks. Cofferdams (which see) are used in preference to caissons where a foundation is to be built in shallow water. See BUILDING.

CALABASH, *kal' a bash*, a gourd similar to a squash or pumpkin. It is the fruit of a climbing annual, cultivated in the same manner as a squash. In tropical countries, the smooth, hard shells of the fruits are dried and used as vessels for holding liquids. See GOURD.

Calabash Pipe. This is a tobacco pipe made from the neck of the calabash gourd. Many smokers consider that calabash pipes give the mildest and sweetest flavor of all pipes. The calabash is the "invention" of a British soldier who served in South Africa during the Boer War. Having broken the bowl of his pipe,



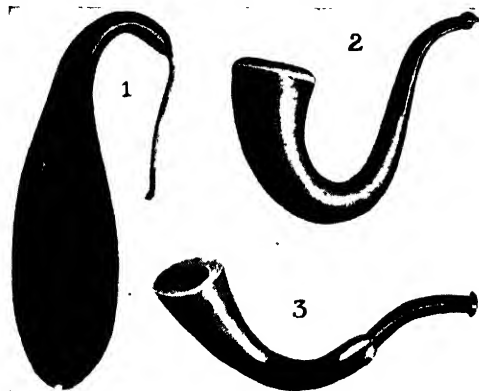
SINKING A CAISSON

The process of construction is outlined in the text.

until the water inside is forced into and out through the earth beneath. Then men are sent into the space inside the caisson through an opening called an air lock, and they continue digging out the earth inside the walls

he hollowed out the thin end of a calabash gourd and attached a mouthpiece to it, creating a device that won enduring popularity.

Calabash Tree. This is an evergreen tree growing in South America. Though it bears a gourdlike fruit, it is an entirely different plant from the calabash gourd described above. The shell of the fruit is very



CALABASH GOURD AND PIPES

(1) Calabash as grown; (2, 3) pipes with stems of differing curves, resulting from varying curves in the gourd.

hard and tough, and is used for domestic utensils of many kinds. For boiling water, it can be placed over a fire many times without being burned. The wood of the tree is used for coach building. B. M. D.

Scientific Names. The gourd family is known scientifically as *Cucurbitaceae*; the calabash gourd is *Lagenaria vulgaris*. The calabash tree belongs to the family *Bignoniaceae*. It is classed as *Crescentia cujele*.

CALADIUM, *ka la' di um*, OR **ELEPHANT'S EAR**, a species of colocasia (which see).

CALAIS, *ka leh'*, one of the adventurers on the Argonautic Expedition. See ARGONAUTS.

CALAIS. See FRANCE (Interesting Cities).

CALAMINE, *kal' a mine*. See ZINC.

CALCIMINE, *kal' si mine*, or cold water paint, has for its basis whiting or carbonate of lime. It must not be confused with white-wash, which is made from caustic lime. Carbonate of lime, or whiting, will not adhere to a surface; therefore it is necessary to use a binder, which is usually glue, casein, or one of the resinous gums. Calcimine is extensively used for inside decorating because of its beauty, cheapness, and hygienic qualities.

The United States Department of Agriculture gives the following directions for making calcimine:

Take 16 pounds of dry Paris white (whiting), and pulverize till free of lumps, then mix with one gallon of boiling water. To this add one-half pound of white sizing glue after it has soaked for four hours in one-eighth gallon of cold water. The glue should be dissolved in a glue pot. Any tint desired may be given the calcimine by stirring liquid coloring into the stock.

The above recipe will make about two gallons of calcimine weighing 12½ pounds per gallon. It may be used at once, but is better after standing for half an hour. Ocher, cochineal, and logwood are the materials usually used for tinting.

The word is sometimes incorrectly written *kalsomine*.

CALCINE, *kal sine'*, **PLASTER.** See PLASTER OF PARIS.

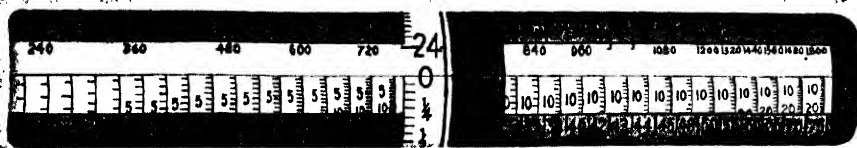
CALCITE, *kal' site*, a very common mineral having some unusual properties and many uses. It is the chief and only essential constituent of chalk, limestone, and ordinary marble. It is also common in veins, where it is often associated with metallic ores. It is generally white or colorless, but may have nearly any color. Calcite has many uses, probably the most important being the manufacture of lime (or quicklime) which, with water, produces mortar. It is also an important part of most cements, and is used in large quantities as a flux for iron ores and as a fertilizer. Exceptionally clear, flawless pieces of calcite are known as Iceland spar, because the best samples come from Iceland. Fine crystals of calcite have been found at Rossie, N. Y., Bergen Hill, N. J., in the copper ores of Northern Michigan, and in many other places. Stalactites and stalagmites are usually composed of calcite. A. N. W.

Chemical Formula. The formula of calcite is CaCO_3 ; that is, a molecule contains one atom of calcium, one atom of carbon, and three atoms of oxygen.

Related Subjects. The reader is referred in these volumes to the following articles:

Chalk	Limestone
Iceland Spar	Marble
Stalactites and Stalagmites	

CALCIUM, *kal' se um*, is never found in a free state, but in its compounds is one of the most abundant and most widely distributed of the chemical elements, forming about 3.5 per cent of the earth's crust. It is a metal whose oxide is quicklime; its hydroxide is slaked lime. Its phosphate forms the main part of the mineral matter of the bones of animals. As a carbonate, it appears in calcite, chalk, limestone, marble, coral, and shells; and as a sulphate, it forms large deposits known as gypsum, alabaster, and selenite. It also appears as a constituent in many minerals, such as fluor spar and apatite, and is found in all soils, in the ash of plants, also dissolved in sea water, and in all springs. The hardness of spring water is almost always due to calcium compounds in solution. When quite pure, calcium is a silver-white metal with a high luster, soft enough to be cut with a file, though much harder than lead. It is about one and a half times as heavy as water, and is ductile and malleable. Its chemical symbol is *Ca*. T. B. J.



GROCERS' COMPUTING SCALE

Illustration of the weighing and computing device. Such scales are made with a capacity up to thirty pounds, and prices are computed as low as five cents and as high as \$1.25 per pound

Related Subjects. The reader is referred in these volumes to each mineral named, and also to the articles CHEMISTRY, DUCTILITY, MALLEABILITY

CALCIUM ARSENATE. See INSECTICIDES AND FUNGICIDES, subhead.

CALCIUM CARBIDE, a hard, brittle crystalline compound of calcium and carbon, extensively used in the manufacture of acetylene (which see). In a pure state, the crystals are colorless and transparent, but the commercial product is an amorphous brownish substance with a metallic luster. The method of producing calcium carbide cheaply was discovered in 1894 by T. L. Willson, while experimenting at Spray, N. C. The commercial process consists in heating a mixture of lime and coke in an electric furnace, at a temperature of 2800° C. Besides its use in acetylene manufacture, calcium carbide is employed in the production of calcium cyanamide, which is used to make fertilizer; it also has a place in metallurgy. The chief sources of supply are the factories at Niagara Falls, N. Y., Spray, N. C., and Sault Ste. Marie, Mich. T.B.J.

Chemical Formula. The formula for calcium carbide is CaC_2 ; that is, a molecule consists of one atom of calcium and two atoms of carbon.

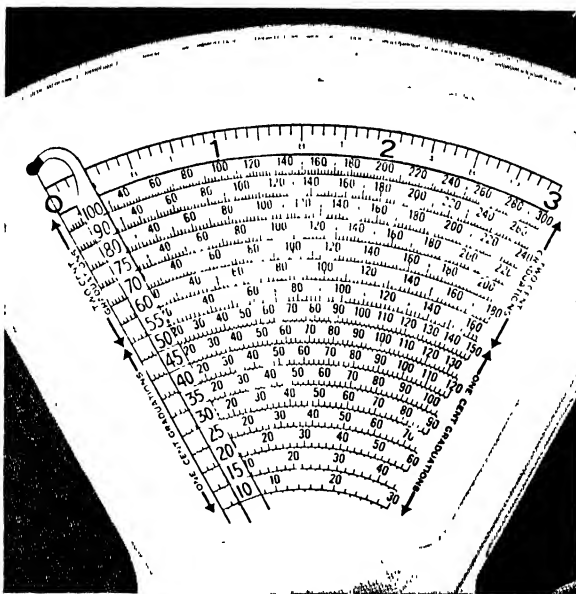
CALCULATING MACHINES, machines for performing various arithmetical operations, including addition, subtraction, multiplication, and division. These are made in many patterns, the sim-

plest of which merely adds, like the fare register on a street car, one unit at a time. This contains a series of wheels, usually three, each of which bears numbers from 0 to 9. When the arm which operates the register is pulled, the wheel representing units moves one step, so as to mark the next higher number. In making a complete revolution this wheel registers ten times, but as the zero appears in the units column, the wheel which represents the tens column is moved forward one figure. Every time the zero in the units column appears in the indicator, a small ratchet catches the tens wheel and pulls it forward one figure. When the tens column shows the zero, exactly the same process takes place in the hundreds column.

On the same principle is the speedometer of the automobile.

The typical adding machine used in business to-day is based on the principle described above. Instead of waiting for the figures in each column to appear, the adding machine may be operated by keys, like a typewriter, and be provided with several columns of figures, to permit manipulation of large numbers. For example, to add 350 and 638: the keys 3 in the hundreds column, 5 in the tens, and 0 in the units,

must be pushed down like the letters on a typewriter; the machine records them when the operator depresses a lever; the number 638 is picked out in the same way, and then by another de-



A SMALLER SCALE

It computes prices and weights from ten cents to \$1.00 per pound, and the capacity of the scale is three pounds.

pression of the lever the machine adds the two numbers at one operation.

On the more complicated forms of calculating machines, it is possible not only to add, but also to subtract, multiply, and divide. On the simplest machines, multiplication is merely repeated addition; on the earliest multiplication machine, to multiply 87 by 5 required four turns of a crank, each turn merely adding 87 to the preceding number. The newest machines are much more complicated, but operate more simply, one or two pressures on a lever or button being sufficient for almost any problem. Machines are now constructed to figure discounts and interest.

F.H.E.

CALCULUS, *kal' ku lus*, a branch of mathematics, studied chiefly in colleges and universities after a thorough preparation in algebra, geometry, and trigonometry, but which is now also being taught in some secondary schools. It deals with the properties of related variable quantities and with their rates of change. The two problems below are given to indicate briefly the character of the work in calculus. The first is in the practical field of mechanics; the second presents a theoretical problem in astronomy:

A ball is fired up a hill whose inclination is 15° , the inclination of the piece is 45° , and the muzzle velocity of the projectile is 500 feet per second; find the time of flight before it strikes the hill, the path made by the ball, and the distance of the place where it falls from the point of projection.

A particle describes an ellipse under an attraction always directed to one of the foci, it is required to find the law of attraction, the velocity, and the periodic time.

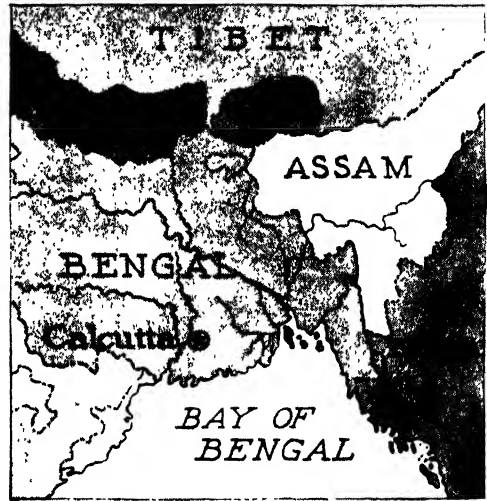
J.W.Y

CALCUTTA, *kal kut' ah*, the largest city of India, capital of the presidency of Bengal, and until 1912 the capital of the great Indian Empire. It stands on the left bank of the Hooghly, an arm of the sacred River Ganges, eighty-six miles inland from the Bay of Bengal.

Calcutta is a city of temples and palaces, and next to London is the most populous of all the cities of the British Empire, having a population of over 1,263,000. The majority of these are Moslems, though there is a mixture of nearly all races, religions, and languages represented.

Though much of the city is dirty and squalid, Calcutta takes pride in its newer buildings and its historical relics, such as Fort William, the largest fortress in India, and the residence of Warren Hastings. The Maidan, a great park, contains numerous statues and monuments, among which is a plain tablet indicating the position of the terrible Black Hole of Calcutta (which see). In the graveyard of the old cathedral is the tomb of Job Charnock, who founded the city on August 24, 1690. The University of Calcutta controls the educational system of Bengal.

Commerce. From a commercial point of view the city is admirably situated, lying in the delta of the Ganges and Brahmaputra rivers, which drain the richest district of all India. The rivers provide cheap means of communication between inland provinces and the sea. The port of Calcutta extends nearly ten miles along the river and is one of the busiest in the world. Over one-third of the entire foreign trade of



LOCATION MAP

India passes through the city, which in addition to its almost perfect water transportation, has the terminals of three great railway systems.

The principal exports are opium, hides, skins, grain, indigo, cotton, silk, and jute. The center of the jute industry is at Howrah, on the opposite bank of the Hooghly and connected with Calcutta by a bridge 1,530 feet in length. The imports are chiefly manufactured goods, machinery, textiles, salt, and liquor.

History. The early history of Calcutta is closely bound up with that of the East India Company (which see). The small settlement established in 1690 gradually grew in importance; neighboring villages were absorbed and formed the nucleus of what was to be, not only the center of commercial activity, but the political capital of an empire that was to compensate Britain for the loss of its American colonies. In 1756 the town was captured by Surajud Dowlah, native ruler of Bengal; terrible atrocities were committed, but it was later rescued by Clive and Admiral Watson. From 1773 to 1912 it remained the capital of the entire Indian Empire. An Improvement Trust established in recent years has cleared insanitary areas, constructed new roads, and established parks, playgrounds, modern dwellings, and public buildings.

CALEDONIA, *kal e doh' nih ah*, the poetic name for Scotland, but historically the name by which the northern portion of that country and its inhabitants first became known to the Romans. The Roman Agricola invaded the country in 82, defeated the Caledonians in 83, and again in 84, in a battle of which a detailed description is given by the historian Tacitus. Later attempts to subdue the Caledonians were unsuccessful. They were the Scots and Picts of early English history who harassed the Britons after the Romans withdrew.



OLD CALEDONIA

In his *Lay of the Last Minstrel*, Scott has an invocation to Scotland in which the poetic name for the country is used:

O Caledonia! stern and wild,
Meet nurse for a poetic child!
Land of brown heath and shaggy wood,
Land of the mountain and the flood,
Land of my sires! what mortal hand
Can e'er untie the filial band,
That knits me to thy rugged strand!

CALENDAR, *kal' en dar*, a systematic division and record of time. All calendars must recognize two great natural divisions of time—the day and the year, both of which are recognized as solar periods. The month, on the other hand, seems to have been suggested by the periods of the moon. The week is an arbitrary division whose origin is ascribed to various causes.

Among ancient peoples there were many differences in calendars. The Egyptians divided the year into twelve months of thirty days each, and added five days at the end of the year. The year was thus too short by nearly six hours. The Greek year includes twelve months of thirty and twenty-nine days, alternately. This arrangement gave a year of only 354 days, 11½ days short of a solar year. To make up this difference, an extra month was added in alternate years, except that every eight or nine years the extra month was omitted.

The old Roman calendar was even more confused. The earliest known system among the Romans was a year of ten lunar months, four of which had 31 days, the remainder only 30. This year of 304 days was too short by about one-sixth. Each year thus began two months earlier in the season than the last, five natural or solar years forming six calendar

years. About 700 B.C., January was added to the beginning and February to the end of the year. This made a year of 354 days, as in the ancient Greek calendar. Every second year a month of 22 or 23 days had to be added to compensate for the 11½ days lost. About 450 B.C., the months were rearranged in their present order, but March was regarded as the beginning of the year. Owing to the addition of a day for "luck," the calendar year was then 366½ days long. In a period of twenty-four years, therefore, the calendar would be twenty-four days ahead of true time. A law was passed authorizing the pontiffs to deduct twenty-four days at any time in the last eight years of a period of twenty-four. This power was abused to such an extent for personal ends, such as collecting revenue, that by the time of Julius Caesar, the calendar equinox differed from the astronomical equinox by three months.

In 46 B.C., Caesar decreed the reform of the calendar. The periods of the moon were disregarded, and the year was divided into twelve months of 31 and 30 days alternately, except February, with 29 days. February was to have 30 days every fourth year. The seasons were readjusted to the calendar by making the year 46 B.C. fifteen months long, from October 13 to the second following December 31. This year is known as the "year of confusion." The new year then began on January 1. In the reign of Augustus, one day was taken from February and added to August, in order that the month named for Augustus might be as long as that named for Julius Caesar. The lengths of the following months were then rearranged to prevent three months of 31 days occurring in succession.

The Julian calendar provided a year of 365½ days, or 11 minutes 14 seconds longer than the true solar year. This difference led to a gradual change in the calendar date of the equinox, until about 1580 it fell on March 11, ten days earlier than it should have occurred. In 1582 Pope Gregory XIII determined to correct this discrepancy by dropping ten days from October. By this arrangement, the day that would have been October 5, 1582, in the Julian calendar became October 15, and the next equinox was thus restored to its proper date. Under the Julian calendar, a single day was gained in about 128 years, because the calendar year was a few minutes longer than the solar year. To correct this discrepancy, the Gregorian calendar omits the additional day in February in century years not divisible by 400. Thus 1600 was a leap year, but 1700, 1800, and 1900 were common years. The year 2000 will be a leap year. The difference between the civil calendar and the astronomical year now averages only 25.95 seconds, which amounts to a single day in 3,330 years. Thus, in 4012, the

calendar, if continued as at present, will be one day ahead of the sun.

The Gregorian calendar was adopted almost immediately by the Roman Catholic nations of Europe. The states of Germany retained the old style until 1700, and England did not change until 1752. Russia, after the repudiation of religion, adopted the Gregorian calendar (1923), and Turkey, in 1928.

Ecclesiastical Calendar. The Church calendar is regulated partly by the sun's position and partly by the moon's phases. Such days as Christmas, the Feast of the Circumcision, and the Nativity of the Blessed Virgin are *fixed days*, originally set according to the solar calendar. Such days as Easter, however, are known as *movable feasts*, their date being determined by the moon's periods. Thus, Easter is the first Sunday after the first full moon upon, or following, the vernal equinox. The other principal movable feasts are Ash Wednesday, Palm Sunday, Good Friday, Ascension, and Pentecost.

Hebrew Calendar. Hebrew chronology be-

gins with the Creation, which is supposed to have taken place 3,760 years and 3 months before the beginning of the Christian Era. To the number of years in the Gregorian calendar, 3,761 must be added to find the number of the Hebrew years; thus 1950 in the Gregorian calendar will be 1950+3761, or 5711. The Hebrew year ordinarily consists of twelve lunar months: Tisri, Hesvan, Kislev, Tebet, Sebat, Adar, Nisan, Yiar, Sivan, Tamuz, Ab, and Elul. These months are alternately 30 and 29 days long. At intervals of nineteen years, however, an extra or *embolismic* month of 29 days, called Veadar, is inserted between Adar and Nisan, and Adar is given 30 days instead of 29.

Mohammedan Calendar. The Mohammedans reckon time from the Hegira, which occurred in A.D. 622. The Mohammedan year consists of twelve lunar months, or 354 days. As the calendar year is much shorter than the solar year, the Mohammedan new year constantly retrocedes through the seasons. In the course of thirty-two and one-half years, the Mohammedan new year completes its back-

For ascertaining any day of the week for any given time within two hundred years from the introduction of the New Style, 1753, to 1952, inclusive

YEARS 1753 TO 1952									Jan	Feb	Mar.	Apr	May	June	July	Aug	Sept.	Oct	Nov.	Dec
1753g 1754d	1781g 1782d	1800e 1801a	1828q 1829a	1856q 1857a	1884q 1885a	1900g 1901d	1928h 1929d	a	4	7	7	3	5	1	3	6	2	4	7	2
1755e 1756p	1783e 1784p	1802b 1803c	1830b 1831c	1858b 1859c	1886b 1887c	1902e 1903a	1930e 1931a	b	5	1	1	4	6	2	4	7	3	5	1	3
1757c 1758f	1785c 1786f	1804h 1805d	1832h 1833d	1860h 1861d	1888h 1889d	1904k 1905f	1932k 1933f	c	6	2	2	5	7	3	5	1	4	6	2	4
1759g 1760q	1787g 1788q	1806e 1807a	1834e 1835a	1862e 1863a	1890e 1891a	1906g 1907d	1934g 1935d	d	2	5	5	1	3	6	1	4	7	2	5	7
1761a 1762b	1789a 1790b	1808k 1809f	1836k 1837f	1864k 1865f	1892k 1893f	1908l 1909b	1936l 1937b	e	3	6	6	2	4	7	2	5	1	3	6	1
1763c 1764b	1791c 1792h	1810g 1811d	1838g 1839d	1866g 1867d	1894g 1895d	1910c 1911f	1938c 1939f	f	7	3	3	6	1	4	6	2	5	7	3	5
1765d 1766e	1793d 1794e	1812l 1813b	1840l 1841b	1868l 1869b	1896l 1897b	1912m 1913e	1940m 1941e	g	1	4	4	7	2	5	7	3	6	1	4	6
1767a 1768k	1795a 1796k	1814c 1815f	1842c 1843f	1870c 1871f	1898c 1899f	1914a 1915b	1942a 1943b	h	7	3	4	7	2	5	7	3	6	1	4	6
1769f 1770g	1797f 1798g	1816m 1817e	1844m 1845e	1872m 1873e		1916n 1917g	1944n 1945g	k	5	1	2	5	7	3	5	1	4	6	2	4
1771d 1772l	1799d	1818a 1819b	1846a 1847b	1874a 1875b		1918d 1919e	1946d 1947e	l	3	6	7	3	5	1	3	6	2	4	7	2
1773b 1774c		1820n 1821g	1848n 1849g	1876n 1877g		1920p 1921c	1948p 1949c	m	1	4	5	1	3	6	1	4	7	2	5	7
1775f 1776m		1822d 1823e	1850d 1851e	1878d 1879e		1922f 1923g	1950f 1951g	n	6	2	3	6	1	4	6	2	5	7	3	5
1777e 1778a		1824p 1825c	1852p 1853c	1880p 1881c		1924q 1925a	1952q	p	4	7	1	4	6	2	4	7	3	5	1	3
1779b 1780n		1826f 1827g	1854f 1855g	1882f 1883g		1926b 1927c		q	2	5	6	2	4	7	2	5	1	3	6	1

ward course through the seasons. The Mohammedan calendar also divides the years into cycles of thirty years each. Of each cycle, nineteen are regular years of 354 days, and eleven years have an extra day. This method of computation is nearly as accurate as the Gregorian calendar. The Mohammedan calendar, based on the periods of the moon, has an error of one day in about 2,400 years; the Gregorian calendar, based on the revolutions of the earth around the sun, has an error of one day in 3,330 years.

Perpetual Calendar. A perpetual calendar is one which shows the day of the week for any date. In the simple form above, the letters after each year refer to the table of months, while the figures in the table of months refer to the table of days. For example, to find on what day of the week December 25, 1900, fell, look in the table of years for 1900. The letter *g* is attached. Then look for *g* in the table of months; in the parallel line, and under December, is the number 6. The twenty-fifth day in column 6 of the table of days is Tuesday. Christmas, 1900, fell on Tuesday.

Shall the Calendar Be Changed Again? Under the present calendar, a "month" may be four weeks, thirty days, a calendar month, or a lunar month, and the irregularity of calendar months causes constant difficulty in modern business. Calendar reform has been consist-

ently urged, and a League of Nations committee has considered what is known as an "International Fixed Calendar." According to this plan, the year would consist of thirteen months, of twenty-eight days each; the extra month might be inserted between the last Saturday of one year and the first Sunday of the next, between December and January, or between June and July, probably the latter, and might be called Sol. Every four years, the extra day which is now added to February would be inserted between the end of one year and the beginning of the next.

As all months in the new calendar would have exactly four weeks, or twenty-eight days, this equality would be of great advantage in computing the amount of pay checks, interest, working days, statistical tables, insurance, and the like. Each month would always have four Sundays, never five. Holidays, Sundays and birthdays would always fall on the same day of the week; the first day of every month would always be Sunday, and the last day would be Saturday. Christmas and the Fourth of July would fall on Wednesday.

The new calendar is based on a scheme worked out by Moses B. Cotsworth, who, as adviser to a railroad general manager, found the Gregorian calendar confusing and hampering. Advocates of the new plan point to the fact that several large business concerns have

TABLE OF DAYS

1	2	3	4	5	6	7
Monday 1	Tuesday 2	Wednesday 3	Thursday 4	Friday 5	Saturday 6	SUNDAY 7
Tuesday 2	Wednesday 3	Thursday 4	Friday 5	Saturday 6	SUNDAY 7	Monday 8
Wednesday 3	Thursday 4	Friday 5	Saturday 6	SUNDAY 7	Monday 8	Tuesday 9
Thursday 4	Friday 5	Saturday 6	SUNDAY 7	Monday 8	Tuesday 9	Wednesday 10
Friday 5	Saturday 6	SUNDAY 7	Monday 8	Tuesday 9	Wednesday 10	Thursday 11
Saturday 6	SUNDAY 7	Monday 8	Tuesday 9	Wednesday 10	Thursday 11	Friday 12
SUNDAY 7	Monday 8	Tuesday 9	Wednesday 10	Thursday 11	Friday 12	Saturday 13
Monday 8	Tuesday 9	Wednesday 10	Thursday 11	Friday 12	Saturday 13	SUNDAY 14
Tuesday 9	Wednesday 10	Thursday 11	Friday 12	Saturday 13	SUNDAY 14	Monday 15
Wednesday 10	Thursday 11	Friday 12	Saturday 13	SUNDAY 14	Monday 15	Tuesday 16
Thursday 11	Friday 12	Saturday 13	SUNDAY 14	Monday 15	Tuesday 16	Wednesday 17
Friday 12	Saturday 13	SUNDAY 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18
Saturday 13	SUNDAY 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19
SUNDAY 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20
Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	SUNDAY 21
Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	SUNDAY 21	Monday 22
Wednesday 17	Thursday 18	Friday 19	Saturday 20	SUNDAY 21	Monday 22	Tuesday 23
Thursday 18	Friday 19	Saturday 20	SUNDAY 21	Monday 22	Tuesday 23	Wednesday 24
Friday 19	Saturday 20	SUNDAY 21	Monday 22	Tuesday 23	Wednesday 24	Thursday 25
Saturday 20	SUNDAY 21	Monday 22	Tuesday 23	Wednesday 24	Thursday 25	Friday 26
SUNDAY 21	Monday 22	Tuesday 23	Wednesday 24	Thursday 25	Friday 26	Saturday 27
Monday 22	Tuesday 23	Wednesday 24	Thursday 25	Friday 26	Saturday 27	SUNDAY 28
Tuesday 23	Wednesday 24	Thursday 25	Friday 26	Saturday 27	SUNDAY 28	Monday 29
Wednesday 24	Thursday 25	Friday 26	Saturday 27	SUNDAY 28	Monday 29	Tuesday 30
Thursday 25	Friday 26	Saturday 27	SUNDAY 28	Monday 29	Tuesday 30	Wednesday 31
Friday 26	Saturday 27	SUNDAY 28	Monday 29	Tuesday 30	Wednesday 31	Thursday 32
Saturday 27	SUNDAY 28	Monday 29	Tuesday 30	Wednesday 31	Thursday 32	Friday 33
SUNDAY 28	Monday 29	Tuesday 30	Wednesday 31	Thursday 32	Friday 33	Saturday 34
Monday 29	Tuesday 30	Wednesday 31	Thursday 32	Friday 33	Saturday 34	SUNDAY 35
Tuesday 30	Wednesday 31	Thursday 32	Friday 33	Saturday 34	SUNDAY 35	Monday 36
Wednesday 31	Thursday 32	Friday 33	Saturday 34	SUNDAY 35	Monday 36	Tuesday 37

either adopted this plan, or had already worked out a similar scheme of their own for their accounting departments, at a considerable profit to themselves.

Related Subjects. The reader is referred in these volumes to the following articles:

Ascension Day	Gregory (Pope)
Ash Wednesday	Hegira
Augustus	New Testament
Caesar, Julius	Chronology
Chronology	Palm Sunday
Equinox	Pentecost
Good Friday	Year

CALENDAR STONE. See AZTEC.

CALENDS, kal' endz. See KALENDS; MONTH (Days of the Month).

CALGARY, kal' ga rié, ALTA., the largest city in the province of Alberta and the largest in Canada between Winnipeg and Vancouver. Founded in 1883, in 1891 Calgary was a community of 3,800 people, and ten years later the population was only 4,800. In 1911 it was the home of 43,704 people; by 1921 the population had increased to 63,305, making it the eighth city in the Dominion. The census of 1926 gave the city 65,513 people.

Ideal Location. The reason for this rapid growth is Calgary's location, which is ideal both for manufacturing and for distribution of products. The city is nearly midway between Winnipeg and the Pacific coast, being 642 miles east of Vancouver, B. C., and 832 miles west of Winnipeg. It is 104 miles south of Edmonton, the capital of Alberta, 480 miles west of Regina, and 400 miles southwest of Saskatoon.

Calgary, by its location, is the natural supply station for the rich surrounding stock-raising and farming sections, and also for the mining districts of the mountain regions. The country tributary to this city is estimated at 150,000 square miles, an area equal to nearly three times the state of Michigan. The marvelous growth of the Canadian West, added to Calgary's natural advantages, has also brought many manufacturing establishments to the city. Within a short distance is a supply of coal sufficient to supply cheap power and fuel for centuries. The region is supplied with natural gas. Electrical power for manufacturing purposes is developed on the Bow River, a short distance west of the city.

To the west of the city are the foothills of the Rocky Mountains, and beyond them are visible the snow-capped peaks of the mountains themselves. Within easy reach of Calgary are Banff and other famous mountain resorts. The city lies on a plateau, at an altitude of 3,437 feet. On one side, the plateau is cut by the Bow River, whose cool waters flow from the pass traversed by the main line of the Canadian Pacific Railway. At Calgary, the Bow River is joined by one of its tributaries from the southwest, the Elbow River.

Railroads. The two great Canadian transcontinental railways, the Canadian Pacific and the Canadian National, with their various connections, give Calgary connection with the important cities of Canada.

Trade and Industry. To Calgary are sent the raw products of the prairies and the mountains—cattle, horses, hogs, sheep, grains, coal, clay, stone, lumber. The city forwards a part of these products to other centers, but an increasing proportion is used in local factories. The factories of the city produce flour, biscuits and bread, caskets, auto tops and bodies, packing-house products, and more than a score of other articles.

Calgary is an important railway divisional point, with large repair shops which add more than \$1,000,000 to the city's manufactures. The Imperial Oil Company selected the city as the location of a new refinery, costing \$3,000,000.

Other Features. The city is laid out, for the most part, in regular rectangles, with wide streets. In and about the town are a number of recreation spots, including Victoria Park, 103 acres; Reservoir Park, eighty-three acres; and Shaganappi Park, ninety-six acres. The city has a number of Roman Catholic separate schools, four colleges, a Provincial Normal School, and the Provincial Institute of Technology. See illustration, page 188.

CALHOUN, kal' hoon', JOHN CALDWELL (1782-1850), an American statesman, one of the ablest and most distinguished advocates of the "states'-rights" doctrine. For forty years he was prominent in national affairs, and in all that time no word was spoken against his character, no doubt was ever felt as to his great ability. But he had championed what proved an impossible cause, striving for a Union which should be outwardly strong but should have as its elements practically independent states. As Webster's slogan, famous the world over, was "Liberty and Union, now and forever, one and inseparable"; as Jackson's was "The Union must and shall be preserved," so Calhoun's was "Liberty dearer than Union."

Calhoun was born on March 18, 1782, near Abbeville, S. C., of Scotch-Irish parents. His early education was meager, for the family was poor, but in 1802 he was able to enter the junior class at Yale College. Graduating with honors two years later, he continued his study of the law, was admitted to the bar, and began to practice at Abbeville. In the next year (1808), he was elected to the state legislature,



Photo: U. S. A.

JOHN C. CALHOUN

and there he proved so noticeably above the average in ability that in 1811 he was sent to Congress. Almost at once he became prominent as an adherent, strangely enough, of Henry Clay, and the two "war hawks," as they were called, did much to bring on the War of 1812 with England. A national bank, a strong navy, a protective tariff—all these Calhoun favored in his early years, for he was then a nationalist rather than a states' rights adherent. As Secretary of War from 1817 to 1825, in the Cabinet of Monroe, he displayed remarkable ability.

In 1824, by a large majority, he was elected Vice-President on the ticket with John Quincy Adams, but by this time his views were beginning to shift, and from the date of his reelection to the Vice-Presidency in 1828, this time under Jackson, his theories as he held them to his life's end were fairly well established. The agricultural states of the South were smarting under what they called the "tariff of abominations"—a protective measure which favored the manufacturing states of New England at their expense; and Calhoun came forward as their champion with his "South Carolina Exposition," which declared that no state could be bound by a Federal law which it regarded as unconstitutional. This led to a sharp break with Jackson, and the nullification question was for years in the forefront of public notice. Calhoun resigned the Vice-Presidency in 1832 and entered the Senate, and though Clay arranged a compromise which prevented open warfare on the nullification question, Calhoun remained a bitter critic of Jackson's administration.

From 1832 to 1843, he served in the Senate, in 1844 was Secretary of State under Tyler, and in the next year reentered the Senate, where he remained until his death. At first, his advocacy of slavery was merely incidental to his faith in states' rights, but gradually he came to look upon slavery not merely as necessary but as desirable. He was largely responsible for the admission of Texas to the Union and therefore for the swiftly following Mexican War, but he ardently opposed that conflict. To the last he was active in his efforts for his beloved South, writing a final great speech in 1850 when he was so weak and ill that he had to allow it to be read by a colleague. His *Disquisition on Government* and *Discourse on the Constitution and Government of the United States* were remarkable discussions of constitutional questions.

Related Subjects. The reader is referred in these volumes to the following articles:

Clay, Henry Nullification States' Rights

CALICO, *kal' i ko*, **AND CALICO PRINTING.** When your grandmother was a girl she thought herself fortunate to have a dress or two of pretty calico "print." Nowadays we have so many cloths beautiful in texture, as

well as in color or design, that calico is no longer a favorite for gowns. But nevertheless, many other uses have been found for it. The cheaper grades of some materials, such as *percale* and *cretonne*, are really calico, though people would not buy them as readily if they were called by that name. In England, the word *calico* includes plain white cotton goods, but in the United States and Canada, it refers only to inexpensive cotton cloth stamped with designs in color. See **CLOTH**.

Printing. Most calico has its pattern on one side only. This is because it is printed very much like a newspaper. A copper roller on which the design is engraved is pressed tightly against a padded cast-iron cylinder so placed that the cloth passes between the two, like clothes going through a wringer. The color, mixed with starch or flour to keep it from blotting, is transferred from the engraved part of the roller to the cloth; a knife called the *color-doctor* keeps the smooth part of the roller clean. If more than one color is to be printed, there must be a roller for each. Sometimes, to give the appearance of a cloth in which the design is woven, calico is printed on both sides, the pattern matching exactly.

Before the days of rotary presses, calico was printed by hand work. The design was carved in relief on a wooden block. Anyone who has worked with a rubber stamp knows how hard it is to make an even impression and to set the stamp in exactly the right place each time. Imagine, then, the difficulties of a calico printer of the eighteenth century, with a wooden stamp ten inches long and six inches wide. Yet many very beautiful prints were made, some of them in several colors. It was this process of hand stamping which gave calico its name, for it was introduced into Europe from Calicut, in India, where such stamping originated.

Dyed Calico. The pretty blue and white calicoes so often seen in Dutch patterns, and some more expensive cloths of white and one color, are prepared in several ways. Sometimes the fabric is printed with a *mordant* (see **DYEING AND DVESTUFFS**) and then dyed, the dye taking effect only where the mordant is located. In another process, the cloth is first dipped in a mordant, then printed with a chemical which takes away the mordant in the spots which are to remain white, then dyed. Still another method prints the cloth with wax or clay or a chemical through which the dye cannot penetrate. All of these ways of marking the pattern give it a fadeless color.

The ancient Egyptians were familiar with some of the cloth-printing processes which employ mordants, and the Chinese, from the earliest times, have known how to print with wood blocks. The Japanese used to form charming patterns by dipping the leaves of trees in dye and pressing them on cotton cloth.



CALIFORNIA. A sunny climate and great natural wealth have given America's second largest state the name of **GOLDEN STATE**. The color of gold is in the yellow sands of its deserts; in its state flower, the poppy; and in its golden fruit. Its citizens recognize not only in its mines and their precious metals, but also in its rich farms, in its seashore and mountain playgrounds, and in its mild climate, the wealth which makes it *El Dorado*, the golden land.

Its name, according to most authorities, is taken from that of a fabled island near the equator in the far western seas. Some believe that it is a contraction of the Spanish words *caliente forno*, meaning *hot furnace*, which early travelers used to describe the arid, hot regions of the south.

Size and Location. Exceeded only by Texas in area, California has 158,297 square miles, of which 2,645 are water surface. In this great area Illinois, Iowa, and Ohio might be placed, with room to spare.

To the north lies Oregon; to the east are Nevada and Arizona, with the boundary line of the latter formed by the Colorado River; to the south is that part of Mexico known as Lower California; and to the west stretches the Pacific Ocean. Though there is in the shore line a very decided bend, the eastern boundary line bends, also, and the state is approximately the same width, about 200 miles, throughout all its great length. The coast line of California is over 1,000 miles in length, only Florida having a greater stretch of coast. California has the greatest north and south length of any state except Texas, a total distance, measured through the center of the state, of 750 miles.

The People. In 1845 the white population of California was but little above 5,000; in 1850 it was 92,600; and in 1860, 379,900, for gold had been found. Percentage increase has never again been as great as in those early days, but the growth has been steady, until in 1930 the population was reported as 5,672,009. The state had the highest per cent of growth of all the states between 1920 and 1930. Thirty per cent of the people live on farms or in rural communities.

Statistics show that the Indians are increasing in number rather than diminishing, as is the case in many places. There are about

19,000 Indians in the state. Peaceable and for the most part self-supporting, they live on reservations, most of which are in the south, near the desert country. Their characteristic employment is basket-making, but many of them are farmers on a small scale. In 1920 there were about 34,000 Chinese and more than 71,000 Japanese in the state; the Chinese had decreased and the Japanese had materially increased in number in the preceding decade. Three-fourths of the population are of American birth, 19.9 per cent of white foreign birth.

Of incorporated towns having a population of 4,000 or more, there were sixty-four in 1920, and in these lived about half of the people. The chief cities are Sacramento, the capital; San Francisco, the city of romance; Los Angeles, noteworthy by reason of its phenomenal growth, and now the largest city; Oakland, the chief railway terminal of the San Francisco region; Berkeley, a university town; San Diego, San Jose, Fresno, Stockton, Alameda, Hollywood, and Pasadena. Los Angeles, by repeated annexation of territory, is now the largest city in area in the United States—391.6 square miles.

The Roman Catholic Church is numerically stronger than any other single denomination in California; next in membership rank the Methodists, Presbyterians, Baptists, and Congregationalists.

Education. The state maintains one of the best public-school systems in the Union, and has always been known for the high standards required of its teachers, as well as for the liberal salaries paid them. In charge of the system is a state board of education consisting of ten members appointed by the governor, with a superintendent of public instruction at its head. Funds are provided through state taxation. As in all states which are not thickly populated, the rural-school problem has been difficult, but California has solved it by means of its well-graded country schools for children of elementary school age and its consolidated district high schools. The latter serve whole countryside as community centers, and frequently include gymnasiums, baths, assembly rooms, and theaters; the children are transported by motorbus. Physical education has been made an important feature of the school life through the compulsory physical-education

law. Over thirty-five junior colleges have been established, whereby the student takes his first two years of collegiate work in his own town. Textbooks are supplied free of charge in the elementary schools, and education during eight months of the year is compulsory from eight to sixteen years of age. The percentage of illiteracy is 3.3.

At Arcata, Chico, Fresno, San Diego, San Francisco, San José, and Santa Barbara there are teachers' colleges. The institutions of higher learning include the following schools:

California Institute of Technology, at Pasadena, founded in 1891, has as its governing official Robert A. Millikan (which see).

Claremont Colleges, at Claremont, is an organization composed of two separate colleges, with individual organization but with library and laboratory facilities, etc., in common. One of the schools, Pomona College, was founded in 1888 as a Congregational school but is now non-sectarian. It is coeducational and offers liberal arts courses. The other institution, Scripps College for Women, was opened in 1927.

College of the Pacific, at Stockton, is a coeducational school, supported by the Methodist Episcopal Church. It was founded in 1851.

Mills College, at Oakland, was founded in 1885 as Mills Seminary, and is a non-sectarian college for women.

Occidental College, a non-sectarian, coeducational school at Los Angeles.

Saint Mary's College, at Moraga, near Oakland, a Roman Catholic school founded in 1863.

Stanford University (see STANFORD UNIVERSITY, in these volumes).

University of Redlands, at Redlands, was founded in 1909 as a coeducational institution.

University of Southern California, founded in 1880, is a coeducational Methodist Episcopal school, with colleges of liberal arts, commerce and business administration, pharmacy, dentistry, law, music, oratory, and theology. It directs the Marine Biologic Station at Venice, Calif.

University of California, one of the largest universities in the world. It is located in Berkeley, where its 520 acre campus on the rolling hills overlooks San Francisco Bay and the Golden Gate. When, by the

Congressional act of 1862, California received its portion of the Federal land grant, it was decided to establish a university to take the place of the College of California, founded in 1855. This university was chartered as a state institution in 1868, was opened for instruction at Oakland a year later, and removed to its present location in 1873.

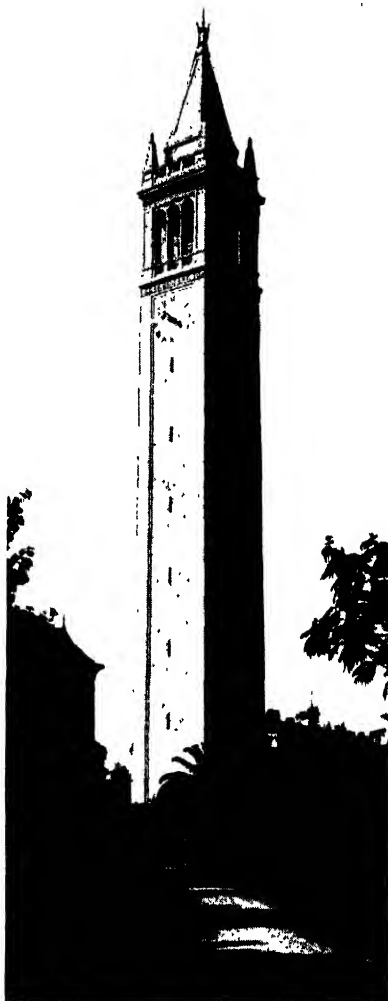
The Berkeley campus has been developed according to an architectural plan adopted in 1808, with the aid of Mrs. Phoebe A. Hearst. Notable among the buildings are the Greek Theater, an open-air structure seating 7,500 people and situated on the side of a hill in a grove of giant eucalyptus trees; the library, housing the famous historical collection of Hubert Howe Bancroft (which see); Benjamin Ide Wheeler Hall; the Sather Campanile, a 300-foot bell tower; and a huge stadium, made possible by public subscription of more than one and one-half million dollars.

In 1927 the university began the building of a new campus for a branch near Los Angeles, on a site east of the suburb of Beverly Hills. Instruction on the new campus began in January, 1929.

On Mount Hamilton, in Santa Clara County, is the Lick Astronomical Department [(see OBSERVATORY (Lick)).] In San Francisco are the George Williams Hooper Foundation for Medical Research, the Colleges of Medicine and Dentistry, and affiliated Colleges of Art and Design, Pharmacy, and Law. The Scripps Institution for Biological Research and the Scripps Institution of Oceanography, the latter the only one of its kind in America, and one of the few in the world, are at La Jolla. The Graduate School of Tropical Agriculture at Riverside, and the University Farm at Davis are also parts of the university. Far away in Santiago, Chile,

is the D. O. Mills Observatory, a branch of the Lick Astronomical Department.

Since 1910; the former Los Angeles Normal School has been known as the Southern Branch of the University of California. Here are situated the Junior College of Letters and Science, offering collegiate instruction in the first two years of the College of Letters and Science, and the Teachers' College. Through its extension division, the university makes the state its campus, working with the Farm Bureau organization to maintain farm advisers, home demonstration agents, and boys' and girls' clubs in practically every county.



SATHER TOWER
University of California, Berkeley

California has a comprehensive state library system, with the State Library in Sacramento at its head. Forty of the fifty-eight counties have rural libraries working in coöperation with the State Library and individual readers.

Charitable and Penal Institutions. The Department of Institutions, working with the Department of Public Welfare, has charge of the correctional and charitable institutions. The two state prisons are San Quentin, and Folsom, at Represa. There are six hospitals for the insane, at Agnew, Talmadge, Napa, Norwalk, Patton, and Stockton. The three state schools for delinquents are at Whittier, Lone, and Ventura. Schools for the deaf and blind are at Berkeley, a state school for the feeble-minded is at Eldridge, and a home for adult blind at Oakland. There are no state or county orphanages in California. These are all maintained by private organizations, to which the state pays a subsidy under certain conditions.

The state has been progressive in its attempts to avoid that harm to lesser wrongdoers which results from housing them with confirmed criminals, and has established a reformatory in which first offenders are confined.

Surface Features. The vast state of California has within its borders the widest diversity of surface. Great peaks almost 15,000 feet in height, depressions well below sea level, far-stretching valleys and river lands, deserts, and some of the most productive regions in the world—all these are to be found.

Despite this variety, however, a relief map of California shows a fairly simple, orderly arrangement. To the east and to the west there are high mountain ranges which are joined together toward the ends of the state, and between these ranges is a valley so extensive that it almost merits the name of a plain. The mountains, and consequently the valley, extend in a generally northwesterly and southeasterly direction, almost parallel with the coast.

The Mountains. Along the Pacific extends the mass of small mountain chains known as the Coast Range, which runs down in many places close to the sea and breaks off abruptly in steep cliffs, rendering the scenery of much of the shore region strikingly picturesque. The series of ranges is divided into numerous ridges and spurs, with many beautiful, fertile valleys. These valleys are drained by short, rapid rivers. Each range has its local name, and the whole coastal system includes the ranges of San Jacinto, Santa Ana, San Bernardino, Sierra Madre, San Rafael, and Monte Diablo. Movements of the earth's crust along this system, causing dislocation of the rocks, are thought to account for the occasional earthquake tremors felt in the coastal region. As a whole, these western mountains have a

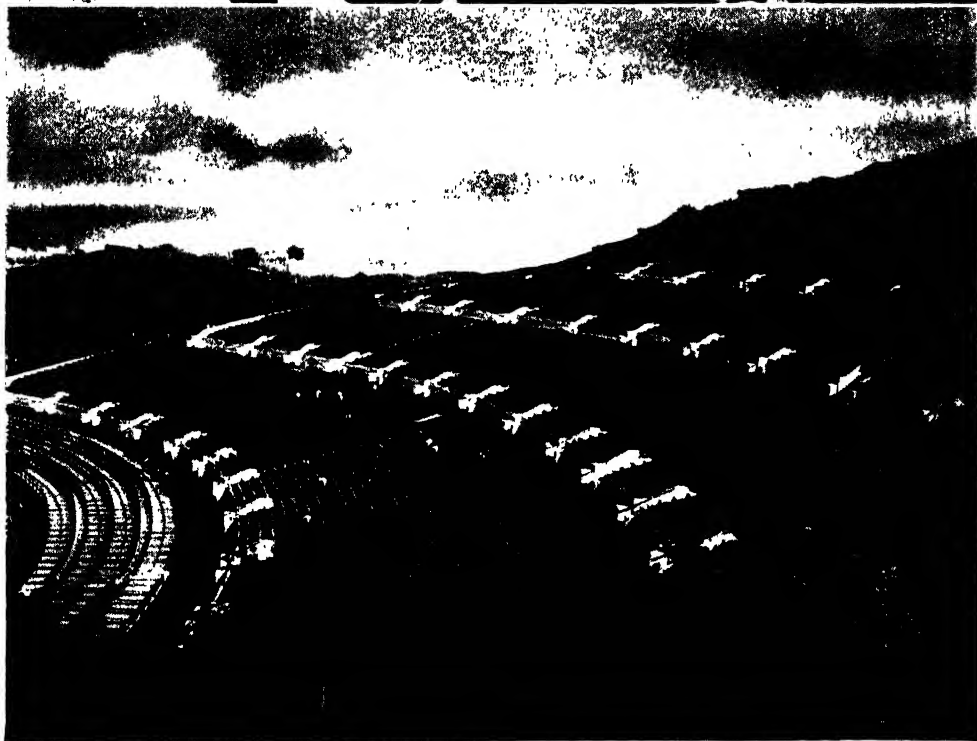
height of from 3,500 to 8,000 feet, but outstanding summits, as San Bernardino and San Jacinto, attain altitudes of over 10,000 feet.

To the east, across the Great Valley, is the far loftier Sierra Nevada, or Snowy Range, the highest and steepest range in the United States. This runs along the eastern border of the state for over 400 miles, and has an average width of about fifty miles. Above its rugged central mass, which has its lowest pass about 5,000 feet above sea level, rise almost a score of peaks above 10,000 feet in height. Chief among these is Mount Whitney, the highest summit in the United States, if Alaska is not counted, but its altitude of 14,808 feet is but little greater than that of Fisherman Peak, which is 14,448 feet (see **WHITNEY, MOUNT**). Other lofty summits are Mount Corcoran, 14,003 feet; Kaweah Peak, 13,752 feet; and Mount Brewer, 13,886 feet. On the east, the Sierra Nevada drops abruptly to the great plain, but to the west, deep canyons have been worn by the rushing rivers on their way to join the Sacramento or the San Joaquin. The most famous of these steep valleys, because the most accessible, is Yosemite (which see).

Much of the beauty of the mountain scenery is due to the action of glaciers that once existed on higher summits, and whose remnants may still be seen, notably on Mount Shasta. These rivers of ice have left towering walls, grotesquely carved, waterfalls, deep canyons, and more than a thousand exquisite glacial lakes. Volcanic action has also added to the varied glory of the mountains. Evidences of volcanoes are found in the north, where lava covers much of the range, and where there are many ash-cones and craters. Mount Shasta (which see), far famed for its beauty, is an example.

To the north the Coast Range and the Sierra Nevada are connected by spurs of the Oregon Cascades, which contain a number of prominent peaks, among them Mount Shasta. To the south the great border ranges are joined by the Tehachapi Mountains, the northern boundary of that varied region known as Southern California.

Southern California. This comprises not only some of the most productive sections of the state, but in the remote southeast some of the most desolate and arid waste land in all the country, as well. The mountains are not so high as those farther north, but most of the surface is more or less broken, and occasional peaks, as mounts Lowe and Wilson, have acquired more than local fame. In the western part, toward the sea, the valleys are fertile, and when irrigated with the waters of the mountain streams that flow through them, they become wonderfully productive. The Imperial Valley has been reclaimed from desert land by irrigation. Of this populous seaward region, Los Angeles is the metropolis.



Two Notable Spots in California. Easter sunrise service on Mount Rubidoux, Riverside. The Hollywood Bowl, a mountain amphitheater, devoted to symphonic concerts. Hollywood is seen in the background.



The King of Trees

The eastern part of Southern California is made up of the Mohave and Colorado deserts, over whose alkaline sands little rain ever falls. Part of this waste region is a high plateau belonging to the Great Basin region, but near its northern limit, not far to the southeast of Mount Whitney, is the deepest depression in all North America—the fitly named Death Valley (which see), about 200 feet below sea level at its lowest point.

The Great Valley. This is the largest valley west of the Rocky Mountains, and the most important. It is 400 miles in length and about forty in width. Fairly level throughout most of its extent, this valley has a slight dip toward the center from both north and south, and each section is drained by a great river (see subhead *Waters*, below). Only in one place is the wall of mountains which shuts it in broken through—on the western side, where the two rivers have cut an opening perhaps a mile wide and flow into San Francisco Bay.

The southern part of the valley is not so well watered as is the northern, nor do its waters drain into the Pacific, but into marsh-bordered lakes. Some of this southern valley region is typical Western desert, with its gleaming alkali soil and its dusty sagebrush.

Almost the entire coast of California is bordered by a submarine plateau, which extends in some places but ten, in others several hundred, miles out into the Pacific. Once this plateau, over which the water is nowhere very deep, was dry land, a part of the North American continent. Evidence that the Pacific coast is rising is to be found in the scarcity of harbors. San Francisco is the only city having a large and well-sheltered natural harbor in California's one thousand miles of coast, as contrasted with the sinking coast of the Atlantic, where harbors and bays are so numerous.

Waters. Naturally in so mountainous a state, the only great rivers are in its one large valley. There are two of these, the Sacramento and the San Joaquin; both rise in the Sierra Nevadas, but hundreds of miles apart. Finding the valley floor, the former flows south and the latter north until they join about sixty miles northeast of San Francisco and make their way to the Golden Gate. At intervals along their course they are joined by tributaries from the east, which flow down from the great Sierras brimming with water from the melting snow. These rapid mountain torrents are not only fine hiding-places for the brook trout, beloved of fishermen, but

The illustration is of "General Sherman," the giant sequoia, pronounced by the United States government the largest tree in the world, measured by the number of cubic feet of wood in it. Twenty men with outstretched arms, hand in hand, can just encircle it.

CALIFORNIA

Acton, (G9)	102	Burlingame, (H2) 13,270	Diamond Spring, (E4)	255	Glendora, (H8) ...	2,761	Laguna Beach, (H9)	1,981	
Adelanto, (H8)	204	Butte City, (D3) ..	357	Dinuba, (F6)	2,968	Glen Ellen, (C4) ..	214	Lagunitas, (C5) ..	510
Adin, (E1)	207	Byron, (D5)	355	Dixon, (D4)	1,000	Gloryetta, (H9) ..	1,020	La Habra, (J4) ..	2,273
Agnew, (C6)	408	Calabasas, (H4) ..	179	Dorris, (C1)	762	Goffs, (K8)	128	Lake Arrowhead, (H8)	306
Agua Caliente, (C4) 405		Calexico, (K10) ..	6,299	Dos Palos, (E5) ..	612	Gold Run, (E4) ..	102	Lake City, (E1) ..	102
Alameda, (H2) ...	35,033	Calipatria, (K9) ..	1,554	Downey, (J4)	4,080	Goleta, (F8)	1,836	Lake Hughes, (G8) ..	255
Albany, (H1)	8,569	Calistoga, (C4) ..	1,000	Downieville, (E3) ..	306	Gonzales, (I6)	1,020	Lakeport, (C3) ..	1,318
Alberhill, (H9)	204	Calipella, (B4) ..	612	Duarte, (K4)	1,326	Goshen, (I6)	204	Lakeview, (J10) ..	459
Albion, (B3)	153	Caliwa City, (F6) ..	204	Ducor, (G7)	102	Grass Valley, (F7) ..	230	La Mesa, (J10) ..	2,513
Alhambra, (J4) ..	29,472	Cammarillo, (F8) ..	510	Dunnigan, (D4) ..	153	Greenfield, (D6) ..	714	Lancaster, (G8) ..	1,326
Alma, (D5)	510	Cambria, (E7)	507	Dunsmuir, (C2) ..	2,610	Greenview, (B1) ..	102	Larkspur, (H1) ..	1,241
Alpaugh, (F7)	565	Camino, (E4)	511	Durham, (D3)	357	Greenville, (D2) ..	510	Lathrop, (D5) ..	266
Alpine, (J10)	244	Campbell, (C5) ..	765	Eagle Rock, (G9) ..	15,300	Gridley, (D3)	1,941	Laton, (F6)	357
Altadena, (J4) ..	5,100	Campos, (J10)	204	Eagleview, (E1) ..	214	Grimes, (D3)	153	La Verne, (H8) ..	2,860
Altaville, (E5)	326	Campo Seco, (E5) ..	201	Earlham, (F7)	204	Grizzly Flats, (E4) ..	151	Lawndale, (J4) ..	369
Altun, (A2)	204	Camptonville, (E3) ..	153	Edgewood, (C1) ..	115	Groveland, (E5) ..	255	Laws, (C5)	102
Alturas, (E1)	2,332	Capitola, (C6)	510	El Cajon, (J10) ..	1,050	Guadalupe, (E8) ..	1,530	Le Grand, (E5) ..	369
Alvarado, (J2)	1,020	Carlsbad, (H9) ..	2,244	El Centro, (K10) ..	8,434	Gustine, (D5)	1,016	Lemoore, (H10) ..	306
Alviso, (J3)	381	Carmel, (D6)	2,260	El Cerrito, (J1) ..	3,870	Lemoore, (H6) ..	1,399	Lennox, (J4)	7,140
Amador City, (E4) 171		Carpinteria, (F8) ..	511	El Dorado, (E4) ..	408	Lewiston, (C2) ..	186	Lincoln, (D4) ..	2,094
Anaheim, (H9) ..	10,995	Caruthers, (F6) ..	128	Elk Creek, (C3) ..	102	Lincoln, (D4) ..	2,094	Linden, (D4)	153
Anderson, (C2) ..	1,428	Casmalia, (F8) ..	204	Elk Grove, (D4) ..	477	Lindsay, (F6)	3,878	Little River, (B3) ..	152
Angels, (E4)	915	Castaic, (G8)	306	Elmira, (D4)	204	Littlerock, (H8) ..	408	Livermore, (K2) ..	3,119
Angels Camp, (E4) ..	959	Castella, (C1) ..	510	El Modeno, (H9) ..	510	Livermore, (K2) ..	3,119	Livingston, (E5) ..	803
Antioch, (D4)	3,563	Castroville, (D6) ..	687	El Monte, (K4) ..	3,479	Lodi, (D4)	6,788	Lockeford, (D4) ..	614
Arbuckle, (C3)	1,530	Cayucos, (E7)	306	El Nido, (E5)	428	Loma, (A2)	306	Lodi, (D4)	6,788
Arcadia, (H8)	5,216	Cazadero, (B4) ..	204	El Rio, (F8)	408	Loma Linda, (H8) ..	1,224	Lomita, (J5)	5,100
Arcata, (A2)	1,709	Cedarville, (E1) ..	612	El Segundo, (H4) ..	3,703	Lomita, (J5)	5,100	Lompoc, (E8)	2,845
Arlington, (H9) ..	3,876	Centerville, (J2) ..	1,020	El Segundo, (H4) ..	3,703	Long Beach, (G9) ..	142,032	Lone Pine, (G6) ..	714
Armona, (F6)	1,224	Ceres, (E5)	981	El Segundo, (H4) ..	3,703	Long Beach, (G9) ..	142,032	Loomis, (D4)	313
Arroyo Grande, (E7) 892		Charter Oak, (H9) ..	357	Empire, (E5)	153	Los Alamitos, (G9) ..	1,530	Los Alamitos, (E8) ..	357
Artesia, (J5)	3,570	Chatsworth, (G8) ..	1,020	Encinitas, (H9) ..	306	Los Alamitos, (G9) ..	1,530	Los Altos, (J3)	510
Artois, (C3)	240	Chico, (D3)	7,961	Engelmann, (F2) ..	816	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Arvin, (G7)	612	Chino, (H9)	3,118	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Atascadero, (E7) ..	2,010	Chowchilla, (E5) ..	817	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Atwater, (C5)	1,324	Chualar, (D6)	204	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Atwood, (H9)	612	Chula Vista, (J10) ..	3,869	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Aubrey, (F5)	257	Claremont, (H8) ..	2,719	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Auburn, (E4)	2,661	Clarksburg, (D4) ..	291	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Avalon, (G9)	1,897	Clayton, (K1)	153	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Avila, (E7)	306	Clearwater, (G9) ..	1,020	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Azusa, (K4)	4,808	Clement, (D4) ..	408	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bakersfield, (G7) ..	26,015	Cloverdale, (B4) ..	759	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Balboa, (H9)	1,530	Clovis, (F6)	1,316	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Baldwin Park, (H8) 4,500		Cochella, (J9)	918	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Banning, (J9)	2,752	Coealinga, (E6) ..	2,851	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Barstow, (H8)	2,550	Cobb, (C4)	102	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Baypoint, (J1)	1,320	Colefax, (D3)	912	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Beaumont, (J9)	1,020	College City, (D4) ..	289	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bell, (G9)	7,884	Collinsville, (K1) ..	255	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bellflower, (G9) ..	9,180	Colma, (H2)	4,080	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bellmont, (H2)	984	Colton, (H9)	8,014	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Belvedere, (H1)	500	Columbia, (E5) ..	612	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Benicia, (C4)	2,913	Colusa, (D3)	2,116	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Ben Lomond, (D5) 612		Compta, (B3)	255	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Beresford, (C5) ..	612	Compton, (J4)	12,516	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Berkeley, (C5) ..	82,109	Concord, (J1)	1,125	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Betteravia, (L8) ..	153	Copperopolis, (F5) ..	306	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Beverly Hills, (J4) 17,429		Corcoran, (F6)	1,768	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bieber, (D1)	102	Cordelia, (C1)	306	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Big Creek, (F5)	510	Corning, (J3)	1,377	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Biggs, (D3)	463	Corona, (H9)	7,018	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Big Oak Flat, (E5) ..	727	Coronado, (H10) ..	5,425	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Biggs, (G5)	714	Corte Madera, (H1) 1,027		Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bigou, (F4)	102	Costa Mesa, (K5) ..	2,550	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Biola, (E6)	179	Cottonwood, (C2) ..	357	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Birds Landing, (K1) 100		Culterville, (F5) ..	123	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bishop, (G5)	1,159	Courtland, (D4) ..	663	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Blairstown, (E3) ..	281	Covelo, (B3)	408	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bloomington, (H9) 2,040		Covina, (H8)	2,774	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Blue Lake, (A2)	555	Coyote, (D5)	102	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Blythe, (L9)	1,020	Crannell, (A1)	918	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bodega, (B4)	204	Crescent City, (A1) 1,720		Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bolinas, (G1)	559	Crescent Mills, (D2) 153		Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bonsall, (H9)	208	Crockett, (J1)	1,824	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Boonville, (B4)	510	Crows Landing, (H5) 306		Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Boulder Creek, (C5) 514		Cucamonga, (H8) 2,040		Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Boyes Springs, (C4) 510		Culver City, (J4) ..	5,669	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bradley, (F7)	102	Cupertino, (C6) ..	3,060	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Brawley, (K10) ..	10,439	Cutler, (F6)	510	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bray, (D1)	204	Cypress, (H9)	311	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Brea, (K4)	2,435	Daguerre, (J8)	102	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Brentwood, (D5) ..	408	Daly City, (H2)	7,848	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Brentwood Heights, (H4)	6,120	Danville, (J2)	714	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bridgeport, (F4) ..	239	Davenport, (C6) ..	510	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bridgeville, (B2) ..	153	Davidson City, (G9) 510		Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Broderick, (D4) ..	2,550	Davis, (D4)	1,243	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Brooks, (C4)	130	Decoto, (J2)	510	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Bryn Mawr, (H9) ..	255	Delano, (F7)	2,632	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Buellton, (E8)	163	Del Mar, (H10) ..	201	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Buena Park, (K4) 3,060		Del Monte, (D6) ..	510	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
Burbank, (J4)	16,662	Dennier, (F5)	204	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048
		Descanso, (J10) ..	102	Escondido, (J9) ..	3,421	Los Angeles, (G8) ..	1,238,048	Los Angeles, (G8) ..	1,238,048

RAILROADS

- | | | | | |
|---------------------------------|---|--------------------------------|---------------------------------|--------------------------|
| 3 Amador Central | 12 California Western R. R. & Navigation Co | 86 Nevada County Narrow Gauge | 98 Santa Maria Valley | 180 Union Pacific System |
| 4 Arcata and Mad River | 13 Camino, Placerville & Lake Tahoe | 88 Northwestern Pacific | 89 Sierra Railway of California | 181 Ventura County |
| 7 Atchison, Topeka & Santa Fe | 16 Diamond & Collier | 89 Pacific Coast | 170 Southern Pacific | 183 Western Pacific |
| 8 Bay Point & Clayton | 25 Holton Inter-Urban | 91 Quincy | 172 Stockton Terminal & Eastern | 184 Yosemite Valley |
| 10 California Central & Eastern | | 95 San Diego & Arizona | 175 Tonopah & Tidewater | 186 Yreka |
| 11 California, Shasta & Eastern | | 97 San Joaquin & Eastern Woods | 176 Irona | 190 Yuma Valley |



furnish water for irrigation and power for electric plants. At certain seasons of the year, both the Sacramento and the San Joaquin overflow their banks and have real flood plains.

The southern part of the valley, beyond the area drained by the San Joaquin, has its mountain streams as well, but these flow, not to the sea, but to brackish lakes, of which Tulare and Buena Vista are the most important. West of the Coast Range, which here withdraws from the shore line, the Salinas River drains the west-central part of the state, and in the north are the Klamath and the Eel.

Of the mountain lakes of California, some of which rival the famous Swiss lakes in beauty, the most widely known is Lake Tahoe, on the borderland of Nevada, 6,225 feet above the sea, with peaks on all sides rising 4,000 to 5,000 feet above it. This largest of the glacial lakes is twenty miles long and 1,500 feet deep, and its clear, icy waters abound in trout.

A peculiar feature of the drainage system is the presence of numerous "sinks" into which the rivers flow and disappear, either by evaporation or by flowing below the surface. Owen's Lake, Mono Lake, the Salton Sea, and Death Valley, which was once an extensive lake but is now a desert in summer and a mud flat in the winter, are such "sinks." Lake Tulare and Buena Vista and Kern lakes receive the drainage of Southern California. A number of lakes in the Great Basin of the south, having no outlet to the sea, are alkaline.

Climate. There is nothing of which a Californian is prouder than of his climate, and for the most part with reason. The state extends from about the latitude of Boston to that of Savannah, but the differences in latitude have far less to do with the variety of climate than has altitude or distance from the sea, and the northern end of the state is almost as mild as the southern. Nowhere save in the high altitudes of the Sierras is anything like the winter cold of the Eastern coast states known. Livestock can remain out-of-doors throughout the year and find plenty of grass for grazing, and flowers bloom out-of-doors at all seasons.

The valleys are so protected by the mountains that high winds are practically unknown, and there is a large proportion of sunny days. In these inner valleys the range of temperature is greater than on the coast, the summer heat sometimes becoming oppressive. Each part of the state, however, believes in the superiority of its own particular climate, even the intensely hot southeastern desert section claiming for itself great healthfulness because of the lack of moisture in the air. Most visitors agree that it is in the southern section, in the neighborhood of San Diego, that the climate most nearly approaches perfection. There the average temperature is 68° in summer and 54° in winter. A favorite boast of the Californian is that it is

necessary to "sleep under blankets" the year round, for even in the warmer sections, the nights are delightfully cool. The year has but two well-marked seasons, a wet and a dry, the former lasting from late October to April.

The rainfall, however, varies decidedly in different localities, decreasing gradually from north to south. In the extreme north, it may be as much as fifty-one inches in a year; at San Francisco, it is about twenty-three inches; at Los Angeles, fifteen inches; and at San Diego, ten inches. In the mountainous region and in the Great Valley it is sufficient for nearly all agricultural purposes, but south of the Tehachapi Mountains, even in the most fertile sections, irrigation is necessary to successful soil cultivation. Dwellers in these irrigated regions believe that they notice an increasing humidity of the air as a result of this continued application of water. Snow is practically unknown, except high in the mountains.

Even over the arid stretches of the Mohave Desert, rain falls occasionally, and when it does, the effect is marvelous. Everywhere bright-hued flowers spring up, until the desert is literally carpeted with them. Within a few days, however, they wither and die, and soon all traces of them are lost under the shifting sands.

The climate of California has been one of the chief features in its remarkable development, not only because it has made possible the growing of crops which can be raised in few other localities of the United States, but because it has attracted to the state hundreds of thousands of people who are seeking a climate without extremes of heat or cold.

A feature of the climate of California is its numerous heat and moisture belts, many of them but a few miles in extent. Only a study of local conditions will make clear the causes of some of the peculiar climatic variations.

A north-and-south mountain range, for instance, may force the winds from the ocean to drop their moisture, and a region of heavy timber and luscious grass, like that about Humboldt Bay, is the result. The great interior valleys, much hotter in summer than the coast region, are constantly being cooled by currents of ocean air which force themselves through the passes; but not all of the regions profit alike. Fresno receives comparatively little of the cool air, and thus has a summer climate fitted to the production of the raisin grape, while certain sections farther north feel more of the cooling effect, and are great wine-grape regions. There may be, too, a protecting foothill range which creates a frostless belt and makes orange-growing possible outside of the regular orange region. This may be seen in Tulare County. Again, as at Watsonville, a sharp rise will condense ocean currents into cool fogs of long duration, and an apple-growing region is created.

Distinctive Plants and Animals. Climatic conditions determine the plant life of a region, and in lesser degree its animal life; and since California is in a sense an "inland island," walled in by mountains and differing from

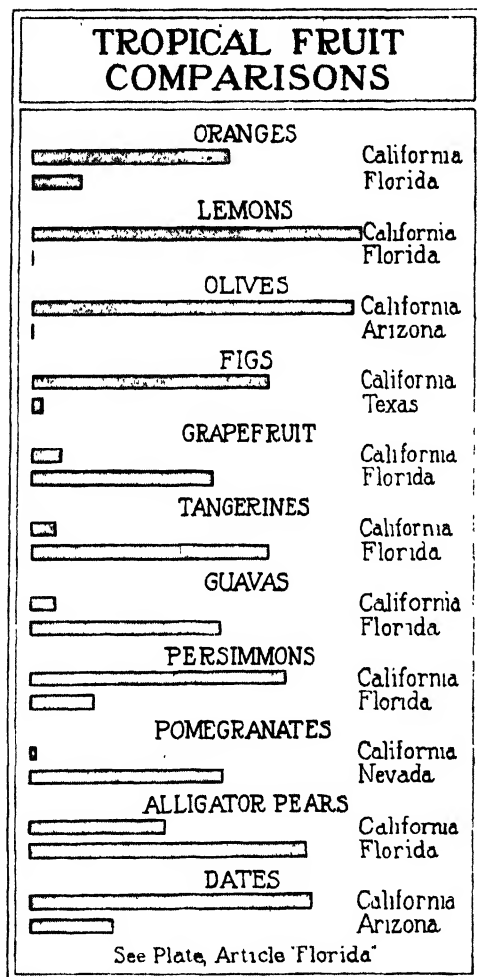
of the north have gigantic forests, mostly of cone-bearing trees, which are here found in greater variety and profusion than anywhere else on earth, and the mountains, both north and south, have such forest growths above a certain altitude. Yellow pine, sugar pine, fir, spruce, cedar, and hemlock—all are there; but most interesting and distinctive of all is the sequoia, which grows nowhere but in California. Of this evergreen tree, there are two species, the redwoods and the "big trees." The former occur as magnificent forests over much of the northern region; the latter, the oldest and largest trees on earth, form scattered groves on the western slopes of the Sierra Nevadas. It is difficult for the mind to grasp the age of these forest monarchs—some of them, authorities declare, must have been great trees in the days when Abraham went out from Ur of the Chaldees. They are possibly the oldest living things on earth. The "big trees" are in Sequoia and Yosemite National Parks and are no longer cut for lumber (see SEQUOIA; PARKS, NATIONAL).

Other trees which grow in few places elsewhere in North America are the eucalyptus, with its narrow, drooping leaves; the Monterey cypress, a scraggy, picturesque, Japanese-looking tree much used for ornamental purposes in gardens; the madroña, a brilliant splash of color when its thin, bright-red outer bark peels off and shows the vivid green beneath; and the pepper tree, one of the most beautiful trees in the world, with spreading branches, feathery leaves, and long clusters of bright-red berries. The Torrey pines at La Jolla are also of interest, as they do not grow elsewhere.

To enumerate the flowers which grow in California would be an almost endless task, so profusely do they flourish everywhere. The beautiful California poppy grows wild, but is much grown as a garden plant as well. The poinsettia, with its brilliant red leaves, has come to be widely known, and is grown in greenhouses farther east, where it is popular as a Christmas decoration. The geranium, elsewhere a "pot plant" or a garden plant of moderate size, in California attains a vinelike growth and stretches to the very roofs of the bungalows. But the glory of the state is its roses. Roses of every variety, even those perfect kinds which the Easterner looks upon only as hothouse flowers, grow everywhere, and many a house is covered with thick-blossoming vines.

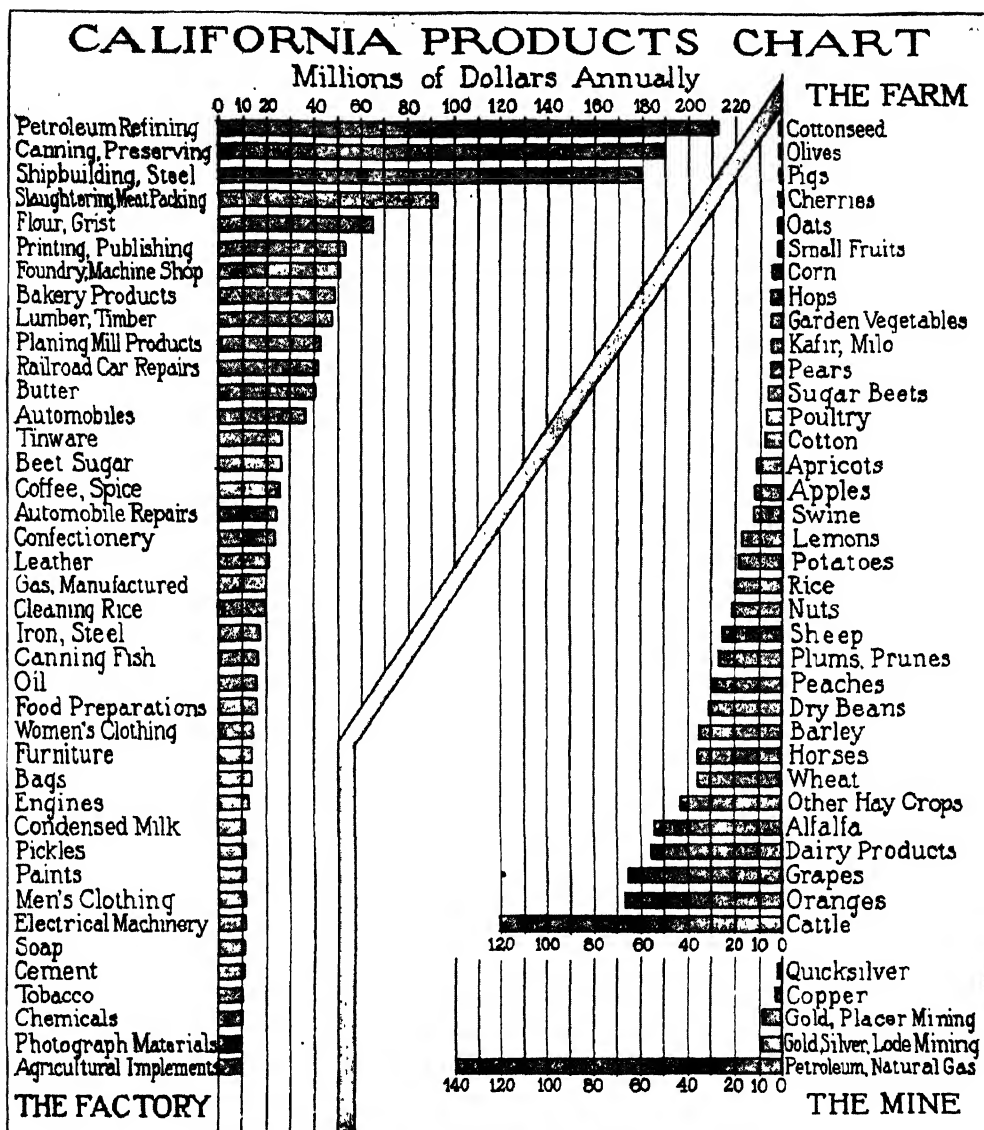
There has also been introduced into this state the edible bamboo, the sprouts of which constitute one of the favorite vegetables in China and Japan.

Animals. In the days before the earliest white men entered California, many animals to-day unknown roamed in its forests and mountains—the tapir, the wild horse, the



even its neighboring states in climate, it has developed a vegetation largely its own. All the growths except the forest trees, which are somewhat independent of surface moisture, are at their best during the rainy season, and throughout much of the state, little green is to be seen during the summer months except in the irrigated sections. The rounded hills covered with a thick mat of sun-dried grass, dotted everywhere with dusty gray-green scrub oaks, are most familiar summer sights, but in the rainy winter everything is a riot of grass and flowers.

In so large a state, there are certain to be distinct zones of vegetation. The coast regions



lion, and even the elephant. There still survive the cougar, the elk, the antelope, the coyote, and most characteristic of all, the grizzly, black, cinnamon, and brown bears. To-day the bears are found only in the wildest parts of the state, while the cougar hides in the rocks or the *chaparral*, as the thick, brushy growths are called. Coyotes are still numerous, and in the mountains deer are to be found. Mountain goats and mountain sheep are found in the Sierra uplands.

Various places along the rocky coast are still the haunts of the seals, or sea lions. Nowhere can these animals be observed better than on their great rookeries on the rocks

opposite Cliff House, in San Francisco. See illustration, in article SEAL.

Agriculture. The days when Mexican grantees held many thousands of acres in a single cattle ranch, and the years, comparatively recent, when California's central valley was one great wheat field, have given way to the modern days of intensive, smaller, unit farming and diversification. The agriculture of California is as varied as its surface, and literally every product of the temperate and sub-tropical zones is grown—all cereals, forage crops, vegetables, fruits, and nuts. California ranks second among the states in total value of agricultural products, only Texas exceeding it,

and it is the greatest fruit- and vegetable-producing state in the Union.

Almost every climate and every product found in the United States is also characteristic of some part of California. The northern coast region is mountainous, with the moderate temperature and high rainfall which fit it for raising forage crops and fruits of temperate regions, and because it is green the year around, has become one of the great dairy regions of the country. Evaporated milk, butter, and cheese are shipped from here. The small fertile valleys of the region about San Francisco are adapted to the raising of all products of the state, except that citrus fruits are not grown commercially, and each valley has some product for which it is especially famous. Thus Sonoma Valley, which specializes in poultry, makes its central city, Petaluma, the "world's egg basket," and Santa Clara Valley, whose market city is San José, is well known for its prunes and apricots.

South of this section, where the coast line turns eastward, is the thickly settled area surrounding Los Angeles, in which the climate is warm. Quantities of varied products are grown, chiefly citrus fruits, walnuts, beans, sugar beets, and truck crops. The Great Valley, which includes the valleys of the Sacramento and the San Joaquin, produces every crop grown in the state; inequalities in rainfall are made up by irrigation. In the eastern mountain regions, where the elevation is more than 1,500 feet, the climate is more like that of Eastern states, and the chief products are alfalfa for seed, hay, and beef cattle.

Over thirty-five per cent of all the fruit grown in the United States comes from California. Nearly three-fourths of the oranges of the United States are grown in this one state, and lemons, grapefruit, and citrons are also produced in abundance. Ninety per cent of the country's grape crop is grown in California. Nowhere else in all the world is there so large an area devoted to the growing of raisin grapes as in California. Fresno County alone produces the major share of the raisins of the world. The raising of dates has passed from the experimental to the commercial stage. Prunes are among the very profitable crops of the state; the raising and canning of ripe prunes has become an extensive industry, and the cultivation of figs is increasing in area. Almonds and walnuts are also produced in large quantities, and of the orchard fruits, as plums, peaches, apples, pears, cherries, apricots, and quinces, there is not one which cannot be successfully grown. The black cherry, the prune, and the apricot, the last-named produced almost exclusively in California, are especially important, and are shipped eastward in great quantities. Berries may be had almost the year around.

Next to the orange crop, the hay crop is more valuable than any other single product grown in the state; barley is the leading cereal. Other crops include sugar beets; tobacco; vegetables, particularly lettuce, celery, and tomatoes; and cotton, grown chiefly in the Imperial Valley.

Irrigation. Nearly six million acres of the land area is irrigated, giving California first rank in irrigated acreage. Irrigation is used in many scattered sections of the state, and especially in the lower part of the Great Valley, in the section around Los Angeles, and in the Imperial Valley. The latter section, in the southern part of the state, was a parched desert, but investigation proved that its soil was not alkaline, and irrigation opened up a fertile area inviting to settlers.

The water supply for irrigation is derived from streams, lakes, wells (both pump and artesian), and irrigation systems. Many private enterprises depend upon wells. The United States government has completed three irrigation projects in California—the Orland Project, supplying 20,000 acres in the northern end of the Sacramento Valley; the Yuma Project, supplying land in Arizona and 15,000 acres in California from the water of the Colorado River; and the Klamath Project, covering land in Southern Oregon and around Tule Lake in Northern California. More than one-third of the irrigable land in the state is already under irrigation, and this area is increasing constantly.

Stock-Raising. During the Mexican occupation of California, stock-raising was the chief industry, for the wide grass lands needed no irrigation. Vast herds of cattle and flocks of sheep grazed on the public lands, but with the development of other forms of agriculture, this particular branch declined in relative importance, the sheep coming into especial disfavor because the grass which they cropped did not grow again. The raising of stock is still a thriving industry in parts of the state, chiefly in the foothills of the mountain ranges, and dairying is growing in importance. The poultry business is also profitable, and the country around Petaluma, near San Francisco, is one of the chief chicken-growing centers in the world.

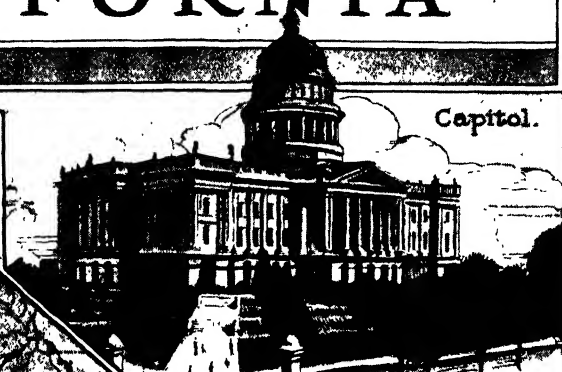
The theory and practice of producers' co-operative associations are being demonstrated to a considerable extent in California. Over a hundred coöperative marketing associations and agricultural organizations have increased producer profits through scientific and intelligent marketing by men trained in that business, while the price to the consumer has advanced little, if at all. The California Fruit Growers' Exchange and the California Associated Raisin Company are the most famous.

Mining. It is impossible to think of California without recognizing its mineral wealth,

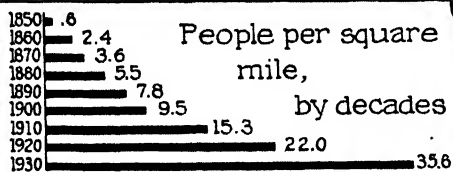
CALIFORNIA

Irrigation
Areas

Religion



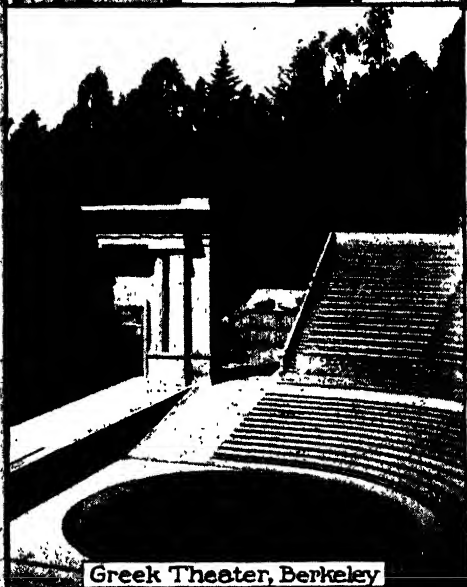
Capitol.



Center
of
Popula-
tion



Mt. Lowe, Railway



Greek Theater, Berkeley

particularly its gold, for it was the discovery of gold in 1848 that revolutionized the life of the state. In the one year of 1849, more than 40,000 people started out for the new gold fields by the overland route, and many of them perished in the deserts before they reached their goal (see GOLD). But obstacles greater than deserts and gigantic mountain chains are necessary to keep man from the places where gold may be found, and the mining industry grew rapidly. The earliest methods were most primitive, for much of the gold lay near the surface, and a pick, shovel, and washing-pan were all those pioneers needed. As the shallow gravel streams were exhausted, real mining was introduced, and remarkably rich veins of gold were opened up, most of them on the western slope and in the foothills of the Sierra Nevadas. The "mother lode" proved to be one of the richest gold-bearing quartz veins in the world. The largest gold nugget ever found in California weighed 195 pounds and was worth \$43,534. Between 1850 and 1859, about \$55,000,000 worth of gold was produced annually in the state; from that time, the decline has been steady, but not sudden, California still ranking first among the states in gold production. It produces nearly thirty per cent of the annual amount of gold mined, at a value of more than thirteen million dollars.

Silver and copper, too, are mined, though in much smaller quantities. California also produces considerable lead and zinc, a little coal, various clays useful in brick- and tile-making, two-fifths of the world's output of quicksilver, and some of the borate materials in the United States, Death Valley being until lately the principal source of borax supply. Tungsten has been produced in paying quantities in the Mohave Desert, since 1915, and the output is rapidly increasing.

Although gold has played a romantic part in California's history, and is an important mineral resource now, its place as the principal mineral product of the state has been taken by petroleum. California produces more crude petroleum than any other state in the Union, and with Oklahoma and Texas ranks far above all other states. The industry has had a remarkably rapid development; the state contains forty per cent of the estimated reserve supply of the nation. California ranks second in the production of natural gas and third in the production of portland cement.

Fisheries. California is one of the foremost states in the taking and canning of salmon. Sardines and tuna are canned in large quantities, and nearly 3,000,000 cases of canned fish are packed in a year by the many canneries in Monterey Bay and in Southern California. Fish meal and fish oil are valuable by-products of the canneries. Sturgeon, barracuda, smelt,

halibut, soles, mackerel, cod, and bass are caught in the coast waters, as well as the characteristic sand-dab, red snapper, and pompano. The fishes of the streams include Rocky Mountain trout of large size, black bass, and shad.

Industries. California has long been known as an agricultural state, for its distance from the great coal and iron fields retarded manufacturing. However, with the increasing use of water power and the rapid development of the rich oil fields, it has advanced to eighth place among the states in total value of manufactured products. There are over 9,000 manufacturing establishments. Chief of the industries are the refining of petroleum; canning and preserving of fish, fruits, and vegetables; slaughtering and meat packing; and the cutting of timber and the making of lumber products. Almost half of the lumber output is California redwood, and because it is particularly well adapted to the making of shingles, this has become a branch industry of considerable size. The total value of the lumber (pine and redwood) produced annually is close to one hundred million dollars. Meat packing is centered chiefly at San Francisco and Los Angeles; the canning of fruits and vegetables, peaches and asparagus ranks first in value; the making of flour and the printing and publishing industries are also important. San Francisco has one of the largest iron works in America. California leads all the states in the making of olive oil, and sugar refining is becoming increasingly important.

The moving-picture industry in California has had a remarkable development, and is one of the most important sources of income. The output from the studios is valued at more than \$50,000,000 yearly. Production has centered largely in Hollywood, a suburb of Los Angeles. Here the clear air permits the taking of pictures on almost 350 days of the year, while the topography and flora afford varied "locations." See MOVING PICTURES.

Hydroelectric Development. The power of California's rushing mountain streams has not yet been fully utilized, but the state has been a pioneer in hydroelectric power development. Since 1920 it has ranked first in the United States in the production of electricity by water power, and has more than 100 hydroelectric plants; it has an estimated possible development of more than 9,000,000 horse power, fourteen per cent of the total estimated for the United States.

Commerce and Transportation. San Francisco has one of the finest harbors in the world, and within its great bay of about 450 square miles are to be found ships from all countries of the world.

For many years ships have been sailing in and out of the beautiful Golden Gate—first

the frigates of the early explorers; then the great square riggers coming in under full sail from the journey around Cape Horn with their loads of gold-seekers; now the liners, the tramps, and the tankers, in the steadily developing trade with the Orient and South America and the world trade through the Panama Canal, pour their cargoes into the ports of San Francisco and Los Angeles.

Los Angeles and San Diego also have good harbors; that of Los Angeles, formerly known as San Pedro, has been enlarged and improved until it is one of the busiest harbors of the world. The immense oil resources of the southern part of the state have vastly increased the traffic through the Panama Canal in recent years, and made the total foreign water-borne tonnage of Los Angeles exceed that of San Francisco. There is a considerable coastwise trade, and pleasure steamers do a profitable business between the California ports and those farther north.

Of the inland waters, the lower Sacramento River alone is of importance for transportation. It is navigable for 180 miles. On the southeastern border is the Colorado, one of the great rivers of America, which during all but the driest part of the year is navigable for about 300 miles.

Railway connections with the other states of the Union are furnished by four trans-continental lines; the Santa Fe; the southern route of the Southern Pacific, from New Orleans; the northern route of the Southern Pacific, which connects San Francisco with Ogden and there with the Union Pacific; the Western Pacific, which runs from San Francisco to Salt Lake City; and the Denver & Rio Grande. The Union Pacific connects Los Angeles with Ogden; the San Diego & Arizona Railway joins the main line of the Southern Pacific at Yuma, thus connecting San Diego with transcontinental lines. Nearly all parts of the state are in easy reach of railway transportation. The total length of lines within the state is over 9,700 miles.

California has been very progressive in the construction of electric railways, and about the large towns there is a network of over 3,200 miles, the system that joins Los Angeles to the numerous beautiful towns in its vicinity being especially complete.

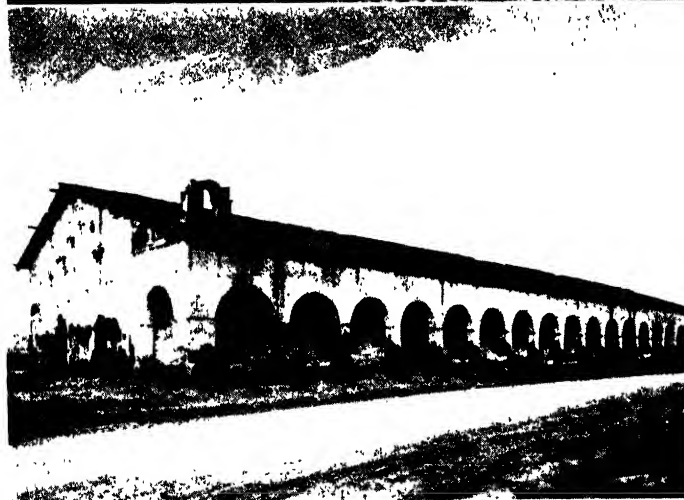
The beauty of California's climate and scenery and the visitors it attracts are factors in the state's rank as third in the number of automobiles owned. The ribbon of the State Highway cuts the Great Valley from end to end, following the route of ancient El Camino Real, the King's Highway, running from San Francisco to San Diego. Over 6,400 miles of state highway and over 650 automobile stage and trunk lines encourage tourists and Californians to enjoy the glorious scenery. The

trips from one end of the state to the other afford a series of wonderful views of ocean, gold-fruited orchards, riots of flowers, grass-grown hills, and towering, wooded mountains which are nowhere to be surpassed. Many famous names stand out among the twenty national forests, four national parks, and five state parks—the incomparable Yosemite, Lake Tahoe, Lassen, Sequoia, Mount Shasta, Klamath, Imperial Valley, Death Valley, Mohave Desert and the missions—all easily reached by highway.

Government. California is governed under a constitution dating from 1879, but more than twenty amendments have since been adopted. Several of importance provided for the initiative and referendum, the recall, a minimum wage law for women, and women's right to vote on an equal basis with men, in advance of the national constitutional amendment. No one may vote who has been convicted of a crime or who cannot read the constitution and write his own name in the English language. By the national law which prohibits Orientals from becoming naturalized, the foreign-born Chinese and Japanese are excluded from citizenship and therefore from voting. Of course, Chinese or Japanese born in the United States are citizens and have the voting privilege.

The executive power is vested in a governor, lieutenant-governor, secretary of state, comptroller, treasurer, attorney-general, and surveyor-general, each of whom is elected for four years. The legislature consists of a senate of forty members, elected for four years, and an assembly of eighty members, elected for two years. The length of sessions is not limited, but pay is allowed members for only sixty days. The judiciary comprises a supreme court, consisting of a chief justice and six associates, elected for a term of twelve years, a superior court for each county; and inferior courts established by the legislature. "Lobbying" is a felony. Notable provisions for expediting trials and decisions are a result of bitter experiences after 1850, and experience under Mexican law. Agreement by three-fourths of a jury is sufficient in civil cases, and a jury may be waived in minor criminal cases. The units of local government are the fifty-eight counties, which are administered under uniform laws. Provision is also made for the organization of townships. A commission form of government is permissible for all cities and towns. San Francisco city and county, being coextensive, have a combined city and county government.

History. The history of California has been full of interest and romance. The Mexican peninsula of Lower California was discovered in 1533, but not until 1542 did an explorer enter the limits of the present state. This was the Spaniard Cabrillo, who visited the vicinity



of Santa Barbara. In 1579 Sir Francis Drake made important coast explorations, sailing as far north as 43° , by reason of which he claimed the territory for England. However, not until almost two centuries later, in 1769, was the first attempt made at settlement, by a Spanish Catholic mission, established at San Diego by the Franciscans.

California's Old Missions. Soon after the first station at San Diego, other missionary posts were begun, and by 1823 there were twenty-one. They reach in a chain from San Diego north of San Francisco to Sonoma, "a day's ride apart," monuments to the bravery of the padres and their leader, Father Junipero Serra. This mission period is one of the most interesting in the history of the state. The buildings themselves, of a style of architecture with which people have been made familiar in recent years through restorations and imitations, were most picturesque, with their surrounding orange groves, grape plantations, and cattle ranches; and the religious and educational work which was done from these as centers was remarkable.

The Spaniards, however, had never acknowledged the right of the friars to the land; the former had begun settlements in 1777, which increased after the Mexican revolution in 1821. The missions began to decline, and in 1834 were formally disestablished by the Mexican government, the Indian converts being scattered and

THREE OF THE OLD MISSIONS

Bells of San Juan Capistrano, northeast of San Diego. San Fernando Mission, built in 1797; it stands on a reservation of ten acres, which was once nearly covered with buildings but is now almost a complete ruin. Another view of San Fernando; the palm trees were planted by the priests in an early day.

the valuable buildings left to plunder and decay.

The movement for the preservation of these old landmarks in California was widely supported, and has resulted in their careful restoration. In some cases, visitors may hear the original bells which rang in the days of Spanish California. All of the missions may be visited; they are listed on page 1004, with location and date of founding.

Beginning of Advancement. The people of the United States had early begun to feel an interest in this far western region, and in 1841 the first emigrant train entered the state. Not until the Mexican War, however, did the United States gain possession of the country, which in 1846 was declared a territory of the Union (see MEXICAN WAR).

Discovery of Gold. On January 24, 1848, James Marshall, an employee of Captain John A. Sutter, gazed wide-eyed at the golden sands he had picked up in the mill race at Sutter's Coloma sawmill. Within one year 40,000 men had flocked to the West to engage in the insane struggle for gold. Mark Twain and Bret Harte in later years chronicled those colorful days—the roughness, the sentiment, and the unexpected heroisms which characterized the “forty-niners.” From all parts of the world people flocked to the territory, and within twelve years more than 260,000 had arrived. Most of them came from the East by “prairie schooners,” with their motto of “California or bust,” over mountain passes and through canyons which it seems incredible any wagon could ever have



OLD MISSION ARCHITECTURE
Vine-covered doorway of San Juan Capistrano. Broken arch in the wall of the same mission.
A corridor at San Fernando.

crossed. Many made the long journey in ships around Cape Horn. As was natural, by far the larger proportion of these early arrivals were men without families, and the absence of home life, the sudden rise to wealth or the black despair of failure, and the roughness of existence in a section which had just been ceded from Mexico to the United States, and which had neither established government nor laws, led to widespread disorder. Laws of a sort there were, however, each camp making its own, and horse-stealing or nugget-stealing was looked upon as worse than killing, and punished accordingly. Whiskey Diggings, Slug Gulch, Hangtown, You Bet, and Squabbletown are only memories now, but they were among the settlements from which has developed the wonderfully fine economic and social character of modern California.

One of the important things which these early Californians had to do was to establish communication with the rest of the world. Steamship lines were established which made the 10,000-mile toilsome passage around Cape Horn. But even more interesting were the overland routes—the Merchants' Express, which had 2,000 wagons and 20,000 yoke of oxen for freighting across the continent, and the Pony

Express, which relayed mail from Missouri to San Francisco in the short space of ten days. It was in connection with this latter business that "Buffalo Bill" established his reputation as a Wild West rider (see CODY, WILLIAM F.). There were stage lines, too, which passed twice a week from Saint Louis to San Francisco, and made it possible to complete the trip from coast to coast in three weeks. In 1869 the Union Pacific Railroad was completed, and the dangerous days of stage travel were over.

Meanwhile, the successful miners were building mushroom palaces along the crest of Nob Hill in San Francisco, and the unsuccessful ones were drifting down from the "Mother Lode" into the Great Valley, filling it with wheat fields and orchards, and beginning the remarkable agricultural development which still continues.

Progress as a State. In 1850 California was admitted to the Union, with a no-

slavery constitution (see COMPROMISE OF 1850). When the War of Secession broke out, the state leaned for a time toward secession, but the Federal party triumphed and the state furnished to the Union cause several companies of volunteers and almost a million and a half dollars.



Photo: A. S. Moore

FATHER JUNIPERO SERRA

A monument unveiled in 1925 at San Fernando, Calif

<i>Name of Mission</i>	<i>Year Founded</i>	<i>Located at or Reached from</i>
San Diego	1769	San Diego
San Luis Rey	1768	Oceanside
Pala	1818	Pala
San Juan Capistrano	1776	Los Angeles
		San Diego
San Gabriel	1771	Los Angeles
Los Angeles		Los Angeles
San Fernando	1797	Los Angeles
San Buena Ventura	1783	Ventura
Santa Barbara	1786	Santa Barbara
Santa Ines	1804	Las Cruces
Purissima	1787	Salinas
San Luis Obispo	1772	San Luis Obispo
San Miguel	1797	Paso Robles
San Antonio de Padua	1771	Jolon
Soledad	1791	Soledad
Carmel	1770	Monterey
San Carlos	1771	Monterey
San Juan	1770	Salinas
San Jose	1766	San Jose
Dolores	1776	San Francisco
Solano	1823	Sonoma

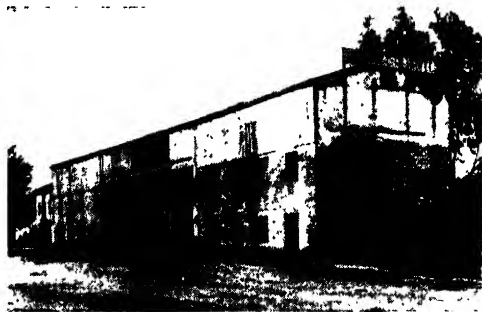


Photo: Visual Education Service

IN MONTEREY

Washington Hotel, the oldest hotel in the state

The history of the state since the war has been one of marked economic development, in which nothing has played a larger part than irrigation (which see).

Early in 1915, there was opened at San Francisco the great Panama-Pacific International Exposition, the buildings for which

had been two years under construction. At the same time the Panama-California Exposition was held in San Diego; this concerned itself more with the southern part of the state,



Photo: Visual Education Service

REMINDEES OF THE PAST

An old Spanish bake-oven of early California. The '40-er and his outfit in the first gold rush

and sought by its architecture and its exhibits to recall the old mission days.

A number of disasters have at times done more or less damage in different parts of the state. The first was the earthquake of April 18, 1906, which injured several of the coast towns and led in San Francisco to fires which destroyed much of the business section. In February, 1914, heavy rainfall caused serious floods in Los Angeles and neighboring towns, and property worth millions of dollars was lost. Two months later, on April 30, 1914, Lassen Peak, a volcano in Northern California, long believed extinct, became active, and on May 14 threw out ashes and rocks, with great clouds of smoke and steam. No lives were lost, but some were in serious danger. In 1928 the breaking of Saint Francis dam drowned about 400 people and destroyed much property.

Oriental Immigration. One of the most difficult problems with which California has had to deal has concerned the immigration of Asiatics. Race prejudice against the Chinese and the Japanese, stimulated by the fact that they entered the state in great numbers, and worked so cheaply that white laborers

could not compete with them, has been the basis for most of the arguments against them. Beginning about 1851, Chinese immigration grew during the '70's and '80's, and agitation against them finally resulted in the Chinese Exclusion Act (which see), passed by the Federal Congress in 1881. Since this did not strictly prohibit them from entering the state, supplementary laws have been necessary since that date, and the Exclusion Act was renewed until the passage of the Immigration Act of 1924.

The problem of the Japanese arose later and was more difficult of solution. Since the beginning of the twentieth century it has been acute. By the "Gentlemen's Agreement" effected in the Roosevelt administration, Japan was prevailed upon to restrict the emigration of laborers to the United States. When it became apparent that the Japanese held in their possession much of the fruit-growing land, and that Japanese within the United States were steadily increasing, the state made repeated efforts to prohibit the acquiring of



Photo: Visual Education Service

THE JUNIPERO OAK

The ceremony of taking possession of California for Spain was enacted in the shade of this old oak by Father Junipero Serra, on June 3, 1770, at Monterey, at the San Carlos Mission.

territory by aliens. The Webb Alien Land-holding Act of 1913 prevented Japanese from owning land, and a more stringent law was passed in 1920.

In 1922 the Supreme Court decided that Japanese are not white people, within the

RESEARCH QUESTIONS ON CALIFORNIA

An outline suitable for California will be found with the article "State."

In traveling, during the summer months, from the coast through the Great Valley and on to the heights of the Sierra Nevadas, what different climates would you encounter?

Which is the most famous mountain peak within the state? Which is the loftiest?

How is suffrage restricted?

What difference would there be in the climate if the mountains ran at right angles to the coast instead of parallel with it?

How was gold first mined in the state? Why is the same method no longer employed?

Is the number of Chinese increasing or decreasing in the state? The number of Japanese? Of Indians? How is Japanese and Chinese immigration restricted?

What are the chief landmarks left by the early Church occupancy of the territory?

What is the present attitude toward them?

Describe the chief beauties of California's most famous mountain lake.

Who was the first white man to enter the territory of California? Who first explored the coast line?

If the state were shut off from communication with the rest of the world, what would be its chief lack?

What is the most famous tree of the state? How large does it grow? What is known about the age of these trees?

Where is there an area which was once but a parched desert but which has been made literally to "blossom like the rose"?

In what way does the Panama Canal affect California?

What is the origin of the name "California"?

How many national parks are there in the state? What are they?

Of what value are the rapid torrents which flow down from the Sierras?

What is meant by the statement that California is an "inland island"?

Where is Death Valley? Describe conditions there.

How large a proportion of the oranges of the United States are grown in this state?

Which is the most valuable product? Most valuable industry?

From the map, find fifteen names that suggest the early Spanish occupancy of the country.

Give several reasons why California is called the "Golden State."

What is meant by the "climatic belts" of the state? Show how they affect crops.

Discuss the outstanding educational features of the state

What is peculiar about the orphan asylums of California?

What do geologists think causes the earthquakes of California?

Describe the most famous glacial valley.

Why do geologists think the coast is rising?

What are sinks?

What changes have taken place since the Mexican occupation in agricultural methods and products? What is the reason for these changes?

Describe the operation and effect of the farmers' coöperative marketing associations.

What part has California played in the motion-picture industry?

What is *El Camino Real*?

What is peculiar about the criminal-court procedure? How does California happen to have such provisions?

Describe the discovery of gold, the great "rush," and social conditions of the time.

What became of some of the less successful miners?

What tree was named for a military man?

Where is the Great Valley?

How does the coast line of California compare in length with that of other states?

meaning of the naturalization law, and could not become citizens of the United States. The Immigration Law of 1924 (see article **EMIGRATION AND IMMIGRATION**) provides for the absolute exclusion of Asiatics except for purposes of travel, study, and temporary business, and terminates the "Gentlemen's Agreement" of 1907. J.L.H.

Related Subjects. More detailed information about the geography and resources of California may be gained from the following articles

CITIES AND TOWNS

The cities named below will be found in their alphabetical places. Those of lesser importance are described on the back of the state map.

Berkeley	Pasadena
Fresno	Sacramento
Long Beach	San Diego
Los Angeles	San Francisco
Oakland	Stockton

LEADING PRODUCTS

Alfalfa	Olive
Apricot	Orange
Barley	Ostrich
Cherry	Peach
Fig	Petroleum
Gold	Plum
Grape	Poultry
Grapefruit	Prune
Lemon	Raisins
Lumber	Walnuts
Natural Gas	Wine

MOUNTAINS

Cascade Range	Shasta, Mount
Coast Range	Sierra Nevada
Rocky Mountains	Whitney, Mount

RIVERS

Colorado	Sacramento	San Joaquin
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UNCLASSIFIED

Catalina	Mare Island
Death Valley	Salton Sea
Golden Gate	Tahoe, Lake
Irrigation	Yosemite National Park

CALIFORNIA, GULF OF, an arm of the Pacific Ocean, on the west coast of North America, lying between the peninsula of Lower California and the mainland of Mexico. It was formerly known as the Sea of Cortez, having been first explored by Cortez in 1536. The gulf is about 700 miles long; in width, it varies from 30 to 150 miles, and in depth, from 600 to 6,000 feet. The Colorado River is the most important stream flowing into it. Valuable pearl and sponge fisheries are located along the western shore. The gulf contains numerous islands, the most important of which are Angel de la Guarda and Tiburon.

CALIFORNIA, LOWER See **LOWER CALIFORNIA**.

CALIFORNIA, UNIVERSITY OF. See **CALIFORNIA** (Educational Institutions).

CALIFORNIA FRUIT GROWERS' EXCHANGE. See **COÖPERATION**.

CALIFORNIA INSTITUTE OF TECHNOLOGY. See **CALIFORNIA** (Educational Institutions).

CALIGULA, *ka lig' u lah*, CAIUS CAESAR AUGUSTUS GERMANICUS (A.D. 12-41), a cruel and dissipated ruler who ranks with Nero among the wicked and tyrannical emperors of Rome. He was the youngest son of Germanicus, and the nephew of Tiberius, whom he succeeded in the year 37. In the beginning of his reign, he made himself very popular by his mildness and his lavish expenditures, but at the end of eight months he was seized with a disorder which permanently affected his brain; after his recovery his career was marked by crimes and excesses that made his reign, in the words of one historian, "a tissue of follies." Though he degraded the imperial dignity by fighting as a gladiator in the arena, he considered himself a god and caused sacrifices to be offered in his own honor. At last, a band of conspirators caused him to be assassinated. See **TIBERIUS**.



CALIGULA

CALIPER, *kal' i pur*. See **MICROMETER**.

CALIPH AND CALIPHATE, *ka' lif, kal' if ate*. After the death of Mohammed, his claims to spiritual and temporal authority were assumed by certain leaders who bore the title *caliph*. The empire which was established through the conquests of the Arabs became known as the *caliphate*, and the followers of the Prophet dreamed of an Islamic world, in which the faithful, wherever found, should bow to one supreme ruler. Between 632 and 750, the caliphs were recognized by all Mohammedans, but in 750 Islam was divided, and thereafter several rival caliphates were established in various parts of the world. In the sixteenth century, the title became hereditary among the sultans of the Ottoman Turks, but there were numerous followers of Mohammed in non-Turkish countries who never acknowledged the spiritual authority of the sultans.

During the World War, Mohammed V, then sultan, endeavored to enhance his position as head of the caliphate, and did, indeed, proclaim a Holy War against the allied nations, but the effort failed outside of his own country. In 1922 the Nationalists of Turkey deposed Mohammed VI and abolished the sultanate, and in 1924 the National Assembly declared the caliphate at an end.

In different Mohammedan countries—Egypt, Morocco, the Malay Archipelago, and elsewhere—there are rival claimants for the office, but no one aspirant is recognized by all Islam.

In the future selection of a caliph, the Turkish government will take no part. See MOHAMMEDANISM; TURKEY (Religion).

CALISTHENICS, *kal is then' iks*, is the art or practice of exercising the body for the purpose of keeping it in health, developing good posture, giving strength to the muscles and grace to the carriage. The term is usually applied to the light, systematic exercises that may be performed without any apparatus, or by the use of such light apparatus as Indian clubs, dumb-bells, and wands. The word is simply another term for light gymnastics. Physical culture, a broader term than either calisthenics or gymnastics, includes the cultivation of the entire physical being, with attention to diet, bathing, mental relaxation, etc., as well as bodily exercise. See GYMNASICS; PHYSICAL EDUCATION.

Derivation. The word *calisthenics* is derived from two Greek words which mean *beautiful* and *strength*.

CALIXTUS, *ka lic' stus*, the name of three Popes.

Calixtus I was born a slave, but rose, by the year 219, to be Bishop of Rome, as the head of the Church was then called. He suffered martyrdom in 224.

Calixtus II, Guido of Vienne, Pope from 1119 to 1124, was a son of the Count of Burgundy. In the second year of his reign, he expelled the antipope, Gregory VIII, from Rome, and two years later concluded with the German emperor, Henry V, the famous Concordat of Worms (see CONCORDAT).

Calixtus III, Alonzo Borgia, was Pope from 1455 to 1458. Though aged and feeble, he tried to institute a crusade against the Turks, but failed. Rodrigo Borgia, father of the notorious Caesar and Lucretia Borgia, who became Pope as Alexander VI, was his nephew.

CALKING, *kawk' ing*. See OAKUM.

CALLA, *kal' ah*, a "flower which is not a flower." Best known of the plants which bear the name is the stately *Ethiopian lily*, or *calla lily*, which came from the banks of the Nile and is grown in America mainly in greenhouses. Any observer would say that it has a most conspicuous, pure-white flower, but the white funnel is really but an outer leaf, or *spathe*, while the real flowers are tiny unnoticeable things crowded on the club-shaped spadix in the center.

Belonging to the same family, but not to the same genus, is the *marsh calla*, or *water arum*, a much smaller plant that grows in the bogs of North America and of Europe. Its shining, arrow-shaped leaves and its white spathe make it very ornamental, and the shape, if not the color, of the latter proclaims it a near relative of Jack-in-the-pulpit. In Lapland the

root of this marsh calla is ground to make bread. See ARUM.

B.M.D.

Scientific Names. The callas belong to the arum family, *Araceae*. The Ethiopian lily is *Richardia aethiopicum*; the marsh calla is *Calla palustris*.

CALLAO, *kahl yah' o*. See PERU (The Cities).



CALLA LILY

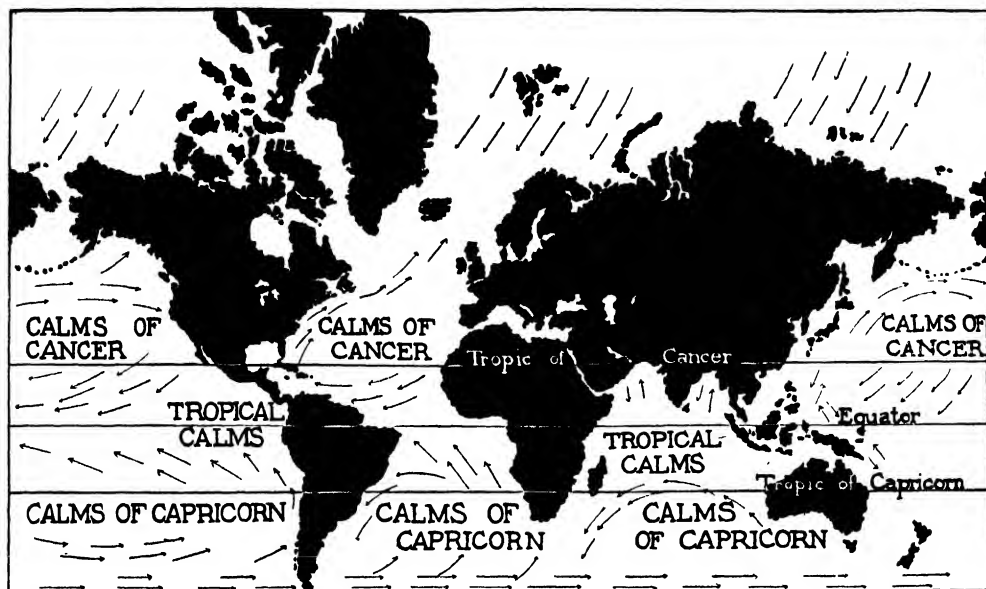
CALLES, *kahl la'*, PLUTARCO ELIAS (1877-), President of Mexico from 1924 to 1928, has been described as a "man of, by, and for the common people." He was born of humble parents in the town of Guaymas, state of Sonora, and it can be said with truth that neither money nor backing, but only his dominating personality, carried him from obscurity to the Presidency. Calles' first public office was that of school superintendent at Hermosillo. Subsequently, he served as chief of police at Agua Prieta, and as mayor of Fronteras. At the time of the revolution that unseated Díaz (1910-1911), Calles had become well known as a radical, and was idolized by the laboring classes. When Alvaro Obregon (elected President in 1920) organized the rebellion against Carranza, in the spring of 1920, he appointed Calles as general of the troops in Sonora. From then on, Obregon and Calles worked in unison, Calles serving successively in Obregon's Cabinet, as Minister of Commerce and Labor, of War, and of the Interior.

In 1923 he resigned from the Cabinet and announced his candidacy for the Presidential nomination, with the backing of Obregon. In August, the Labor party selected him as its candidate, and he received also the support of the farmers and the Socialist party. During the campaign, the candidate of the Coöperative party, Adolfo de la Huerta, instigated a revolution, and Calles fought with the administration forces until March, 1924, when the uprising was suppressed. In the election, held on July 6, Calles was victorious by a large majority. His administration was marked by a vigorous effort to enforce the Constitution with respect to such problems as foreign ownership of land and natural resources, and the separation of



Photo: U & U

FORMER PRESIDENT CALLES



THE REGIONS OF CALMS

the Church and State (see, in these volumes, the discussion of the events of his administration, in the article MEXICO). The relations between Mexico and the United States attained a very friendly status during the Calles régime.

Since the Mexican Constitution forbids the immediate reelection of a President, Calles was ineligible to succeed himself, but gave his support to his old friend, General Obregon. The latter was elected to the Presidency on July 6, 1928, and was assassinated on July 17. Calles publicly announced that he would not serve as President *ad interim* (see OBREGON, ALVARO). See, also, CARRANZA, VENUSTIANO.

CALLING HARE. See PIKA.

CALLIOPE, *ka li' o pe*, in Greek mythology, one of the nine goddesses, called *Muses*, who presided over music, poetry, and science. Calliope, whose name indicated the sweetness of her voice, was the muse of epic poetry. In some myths, she is loved by Apollo, and their son is Orpheus, who charmed the trees and rocks, and even the fierce Cerberus, with his enchanting music.

Modern Designation. The same name has been given to a modern musical instrument which produces tones by means of a series of steam whistles. The name of this instrument is commonly and incorrectly pronounced with the accent on the first syllable, as if there were but three syllables. The callope was at one time a feature of every old-fashioned circus, and is still occasionally heard on pleasure boats. It is one of the least pleasing of the mechanical musical instruments, as the tones it produces are loud and harsh.

Related Subjects. Each of the mythological characters named in this article is described in its alphabetical position

CALLISTO, *ka lis' toh*. See BEAR, GREAT (In Mythology).

CALL LOANS. See BANKS and BANKING (Functions of a Bank).

CALL MONEY. See MONEY (Unusual Terms Applied to Money).

CALMS, REGIONS OF. In the Atlantic and Pacific oceans there are regions along the Tropic of Cancer and the Tropic of Capricorn where for days and sometimes weeks at a time there is no wind. These regions are known as the *Calms of Cancer* and the *Calms of Capricorn*. The calms are caused by descending air coming from cool upper regions. The regions of calms move north and south with the sun, being farther north in the summer in the northern hemisphere and farther south in the winter.

Over the equator, there is the region of *equatorial calms*, called the *doldrums*. Here the air current is upward and there is no horizontal current. This region also moves north and south with the sun.

In the days of sailing vessels, the regions of the calms were usually shunned by sailors, since a ship might lie in them for several weeks awaiting favoring winds. R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles.

Doldrums	Horse Latitudes	Wind
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CALMS OF CANCER. See WIND.

CALMS OF CAPRICORN. See WIND.

CALOMEL, *kal' o mel*, a compound of mercury and chlorine having slow laxative effects. Formerly believed to promote the discharge of bile from the system, calomel is

now known merely to increase temporarily the amount excreted by the lower intestine. In the malarial regions of the Southern United States, calomel was long a familiar household remedy, and it was sometimes taken at intervals, whether actually needed or not. People now are urged not to dose themselves with this or any other drug except as advised by a competent physician. Calomel is regarded as an excellent cathartic at the beginning of mild catarrhs of the alimentary canal, and in cases of headache, nausea, and infection. It is often combined with saline cathartics, because it acts chiefly upon the upper portion of the intestine. Too large doses may cause diarrhœa, abdominal pains, salivation, ulceration of the gums, and bad breath. Physicians prescribe small or divided doses, to be taken at specified intervals. This drug is also applied externally to ulcerations and infected sores, for it is an antiseptic. It is also a remedy for opacities of the cornea.

[Calomel appears on the market as a white, heavy powder which is insoluble in water, ether, or alcohol. Most of it is prepared by heating mercurous sulphate with common salt in an iron vessel and cooling the vaporized product to condensation point. It should be distinguished from bichloride of mercury, or corrosive sublimate, another mercury compound that is a deadly poison. See CORROSIVE SUBLIMATE; MERCURY (Metal)].

CALOOSAHATCHEE, *ka loos a hatch' e*, **RIVER**. See FLORIDA (Waterways); OKEECHOBEE.

CALORIE, OR **CALORY**, *kal' o rie*, a unit employed in measuring quantities of heat. The *small calorie*, used in scientific calculations, is the quantity of heat necessary to raise the temperature of one gram of pure water 1° Centigrade (C.). It is equal to $\frac{1}{778}$ of the British Thermal Unit, which is the quantity of heat required to raise the temperature of one pound of water from 60° to 61° Fahrenheit (F.). The *great calorie*, with which the layman is more familiar, is used in expressing fuel values of food. By fuel value is meant the total number of calories derived from a pound of any given food substance when it is completely oxidized within the body. The large calorie is equal to 1,000 small calories. It is approximately the heat required to raise the temperature of one kilogram of water 1° C., or one pound of water 4° F. E.V.M'C.

Related Subjects. For the method of determining fuel value, see NUTRITION (Heat Given Off); Food (Food and Fuel).

CALORIMETER, *kal o rim' e tur*. See NUTRITION (The Needs of the Body).

CALPE, one of the Pillars of Hercules. See HERCULES, PILLARS OF.

CALUMET, *kal' u met*, the "pipe of peace" of the American Indians, used on all ceremonial occasions, but especially when treaties

of peace were ratified. The pipe was passed around the circle of warriors, and each one took a solemn puff. Native tobacco, with which willow bark or sumac leaves were mixed, was smoked. In the East and Southeast, the bowl



THE CALUMET

was made of white stone; in the West, of a red clay obtained from the famous pipestone quarry of Minnesota, mentioned in Longfellow's *Hiawatha*. The long stem, of wood or reed, was decorated with feathers, porcupine quills, or women's hair. The pipe was given this name by the French Canadians.

CALUMET, MICH. See MICHIGAN (back of map).

CALUMET AND HECLA MINE. See AGASSIZ (Alexander); MICHIGAN (Minerals).

CALVARY. See JERUSALEM.

CALVARY CROSS. See CROSS.

CALVÉ, *kal va'*, **EMMA** (1866-), the stage name of **EMMA DE ROQUER**, a celebrated dramatic soprano, born in France, whose interpretation of the rôle of Carmen, in the opera of that name, won her undying fame. She made her first appearance on the stage at Brussels, in 1882, singing the part of Marguerite in *Faust*, and she afterwards sang in grand opera in Paris, in England, Spain, Russia, the United States, and Canada. Between 1893 and 1904, she was one of the leading stars at the Metropolitan Opera House in New York City, where she was best liked in the rôle of Carmen and in that of Santuzza in *Cavalleria Rusticana*. Madame Calvé also appeared with distinction in Massenet's *Sapho*, Thomas's *Hamlet*, and Samara's *Flora Mirabilis*. After 1909 she devoted her time mainly to concert work. At the height of her fame, her rich soprano voice had a range of two and one-half octaves, and was even and clear throughout, but her success was due in no small measure to her extraordinary dramatic ability.

CALVERT, **CECELIUS**, the second Lord Baltimore, founder of Maryland. See BALTIMORE, SIR GEORGE CALVERT; MARYLAND.

CALVIN, **JOHN** (1509-1564). "The greatest theologian and disciplinarian of the great race of the reformers," and one of the foremost leaders in the history of Christianity, was born at Noyon in Picardy, France. His father was secretary to the bishop of Noyon, and his mother was a beautiful and devout woman.

He received his early education in Paris, later studied in the universities of Orleans, Bourges, and Paris, first for the priesthood and then for the law, early distinguishing himself by his industry and remarkable intellectual power. He became dissatisfied with the teachings of the Roman Catholic Church, and in 1532 allied himself with the cause of the Reformation. Two years later, at twenty-eight, he published *Institutes of the Christian Religion*, one of the most important contributions to Christian literature of all time.

In 1536 Calvin entered Geneva on his way to Strassburg, expecting to remain only one night. Here he was found and held by William Farel, whom he had known in Paris. Farel was a celebrated evangelist, and under his influence Calvin gave up his journey and entered upon what proved to be his life work; with the exception of three years of banishment, he spent the remainder of his life in Geneva.

When Calvin entered Geneva the city was on the verge of political and religious ruin. With Farel's assistance, he soon wrought remarkable changes in the government and the people. A Protestant confession of faith was adopted by the city and made binding upon all citizens. Immoral practices were abolished, and those notoriously unworthy were excluded from the holy communion. Calvin's arbitrary rule, however, aroused strong opposition, and he was expelled from the city. He then spent three years in Strassburg, teaching theology, and he also wrote.

He was recalled to Geneva, where he perfected an organization with himself at the head, which directed the religious and political affairs of the city and controlled the social and individual lives of the people. This rule was established under difficulties, and Calvin was involved in numerous controversies. During this time, through Calvin's orders, Michael Servetus, who had written a book on the Trinity, was burned at the stake. This blot upon the career of the great reformer has never been wiped out.

During his supremacy in Geneva, Calvin maintained correspondence with all the great thinkers of Protestantism, and he was consulted upon points of law and theology by leaders throughout Europe. He also published numerous works which have always been considered standard authority upon the subjects

they discussed. In 1561, the followers of Calvin separated from the Lutherans, thus forming the first great division in the Protestant church. Soon after this Calvin died. The principles of his theology are embodied in the creeds of the Presbyterian and reformed Protestant churches.

Calvinism. The chief points in Calvin's creed can be summarized as follows:

- (1) The knowledge of God is important in the mind of man.
- (2) Creation depends absolutely and continuously upon God, who fosters and guides it by His secret inspiration.
- (3) Sin springs from the will of man. When sin enters the soul, it brings with it a train of circumstances.
- (4) Man was originally a pure being made in the image of his Creator; but he is now fallen and corrupted through his voluntary departure from the good.
- (5) Christ is the mediator to redeem man from sin.
- (6) Men are saved by an act of absolutely free, unmerited grace on God's part, without regard to good works; men, on the other hand, are never condemned, save on the ground of their own sin.
- (7) God, according to Calvin, foreordains or predestines some to surrender to His grace and be saved. He also predestines others, who are no worse, to reject His offer of grace and be lost.

This last article of Calvin's creed has been the source of endless theological discussion.

Related Subjects. The reader is referred in these volumes to the following articles:

Lutherans	Reformation
Predestination	Roman Catholic Church
Protestant	Servetus, Michael

CALYCANTHUS, *kal i kan' thus*, the typical genus of a family of American shrubs related to the rose family. A southern species called *strawberry shrub* is often planted as an ornamental because of its glossy, dark-green leaves and fragrant, chocolate-colored flowers. When crushed, the flowers give off a scent like that of sweet strawberries. The name *Calycanthus* is a compound of Greek words meaning *cup*, or *calyx*, and *flower*. It refers to the tubelike calyx surrounding the pistils. The aromatic bark of various species of *Calycanthus* is called *Carolina allspice*.

B.M.D.

Scientific Name. The scientific name of the calycanthus family is *Calycanthaceae*. The species described above is *Calycanthus floridus*.

CALYPSO, *ka lip' so*, in Greek mythology, a sea nymph who dwelt on a lonely island, on the shores of which Ulysses was shipwrecked. She promised Ulysses immortality if he would remain with her, and succeeded in detaining him for eight years, when he was overcome with longing to see his wife and child. At last, Zeus sent the fleet Hermes to Calypso with the message that she must permit Ulysses to depart, and she helped him build the raft on which he sped upon his homeward course. She then died of grief.



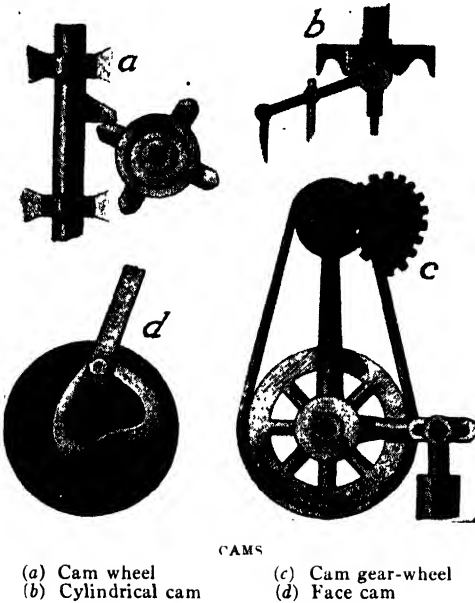
Photo Brown Bros

JOHN CALVIN

Related Subjects. In the article *ODYSSEY* is another account of Ulysses on the island of Calypso. See, also, *ULYSSES*; *JUPITER*.

CALYX, *ka' lix*. See *FLOWER* (Flower Structure).

CAM, in machinery, a simple contrivance for converting a uniform rotary motion into a varied, sliding motion. It is a projecting part of a wheel or other revolving piece, so



placed as to give an alternating or varying motion to another piece that comes in contact with it, and is free to move only in a certain direction. The heart-shaped wheel, shown in *c* in the illustration, is one of the most common forms in use. It is mounted on a shaft and imparts an irregular motion to the wheel in which it meshes.

CAMAGUEY, *kah mah gwa'*. See *CUBA* (Principal Cities).

CAMBER. See *AIRCRAFT* (Why the Airplane Flies).

CAMBIUM. See *ALBURNUM*.

CAMBODIA, *kam bo' di ah*. See *FRENCH INDO-CHINA*.

CAMBODIA RIVER, a name sometimes applied to the Mekong (which see).

CAMBRIAN, *kam' bri an*, **PERIOD**, the earliest of the periods of geologic time comprised in the Paleozoic Era. The name is derived from *Cambria*, the Roman name of Northern Wales. The stratified rocks formed during the period, which include conglomerates, sandstones, shales, and limestones, as well as some lavas, constitute the *Cambrian System*, which is well represented in many parts of the world. Because of the great changes that

have affected the earth's crust in the long interval since Cambrian time, the system nowhere occupies the surface of any considerable area, and everywhere the rocks have been deformed, and in many places metamorphosed into schists, quartzites, slates, and marbles. See *GEOLOGY*; *PALEOZOIC ERA*. L.LaF.

CAMBRIC, *kame' brik*, a thin fabric woven from linen yarn of the finest quality, so called from the town of Cambrai, France, where it is said the cloth was first made. One of the items listed in the private expense record of King Henry VIII, dated 1534, is cambric for his shirts. This fabric is now used generally in making handkerchiefs, collars, cuffs, fine underclothing, and baby clothes. To-day the term cambric is usually applied to a glossy, closely woven, rather stiff cotton imitation of linen cambric.

CAMBRIDGE, *kame' brij*, MASS., a city famed for its historic, educational, and literary associations, and especially as the seat of the first college established in the United States, now Harvard University (which see). Cambridge is one of the county seats of Middlesex County, Lowell being the other, and it is a suburb, and practically a continuation, of Boston, on the opposite side of the Charles River. It is served by the Boston & Maine and the Boston & Albany railroads, and by an extensive system of electric interurban lines. Passenger trains operate from Harvard Square, Cambridge, through a tunnel to the Charles River, and thence over Cambridge Bridge and underground into the Boston subway. Five other bridges span the river, and a viaduct with arches of reinforced concrete forms an elevated structure for trolley cars running between East Cambridge and Boston. The city has an area of over six square miles. It is the fifth city in size in the state. Population, 1930, 113,650.

Harvard University and Radcliffe College (for women) occupy attractive grounds in the heart of the city, or Old Cambridge. North Cambridge has become a fine residential section, and East Cambridge and Cambridgeport are manufacturing districts. Mount Auburn Cemetery, partly in Cambridge and partly in Watertown, is notable as the burial place of Longfellow, Lowell, Holmes, Phillips Brooks, Agassiz, John Fiske, and other distinguished persons. One of the most delightful spots in Cambridge is "Elmwood," the old home of James Russell Lowell. Longfellow's Craigie House, which he occupied while a professor at Harvard, is another interesting feature of the city. Along the Charles River is a beautiful water-front park.

Industry. Cambridge is noted as a center of book publishing, and is the location of the Riverside, Athenaeum, and University presses. The latter dates

from a printing house founded in 1639. Other industrial establishments include those for the manufacture of foundry and machine-shop products, copper, tin, and sheet-iron products, canned meat, furniture, musical instruments, candies, carriages, and lumber products.

History. Cambridge was first settled as Newe Towne in 1630. The present name was adopted in 1638, in honor of Cambridge, England, and a charter was granted in 1846. The city has many features of historical interest. Near Harvard Square is the site of the elm under which Washington assumed command of the Continental army in 1775. The old tree fell in 1923, but a tablet marks the place where it stood for so many years.

Related Subjects. The reader is referred to articles on the persons named in this article, and also to BOSTON, HARVARD UNIVERSITY.

CAMBRIDGE, O. See OHIO (back of map).

CAMBRIDGE, UNIVERSITY OF, one of the two great universities of England, sharing with Oxford the honor of high place among English educational institutions. It is usually regarded as of later foundation than Oxford University, though many have endeavored to establish its claims to seniority. The first Cambridge college was established in 1281 by Hugh de Balsham, bishop of Ely, and named Peterhouse, or Saint Peter's College. The university now comprises seventeen colleges, of which Downing, founded in 1800, is the most modern.

Government of the University. Each of its seventeen colleges constitutes a separate corporation, governed by laws and usages of its own but subject to the laws of the university, just as states and provinces are, in some matters, subject to national laws. The government of the university is vested in a chancellor, the masters or heads of colleges, fellows and students of colleges; and it is incorporated as a society for the study of all the arts and sciences. The legislative senate consists of the chancellor, vice-chancellor, and those who have taken the degree of Doctor or Master of Arts. The discipline of each college is maintained by the dean.

Women's College. No degrees are conferred on women. The students of Girton and Newnham, the chief centers of women's education in England, have full facilities for attending lectures and examinations at the university, receiving certificates on graduation instead of degrees.

CAMBYSES, *kam bi' seez*, II (?-522 B.C.), a son of Cyrus the Great, who became, after the death of his father, in 529 B.C., king of the Medes and Persians. In the beginning of his rule, he had his brother Smerdis secretly put to death, because he feared his influence. In the fifth year of his reign, he invaded Egypt, conquering the whole kingdom within six months, but of his army of 50,000 men sent to take possession of Ammon, in the Libyan Desert, not one returned. He likewise failed

to conquer the Ethiopians. Learning that a usurper who resembled his murdered brother Smerdis had seized the throne, he started back to Persia, but died on the way. According to the Greek historian Herodotus, Cambyses was a cruel ruler whose conduct was almost that of a madman. See PERSIA (History).

CAMDEN, N. J., the county seat of Camden County, is situated in the southwestern part of the state, on the east bank of the Delaware River, opposite Philadelphia, with which it is connected by the great Philadelphia-Camden bridge, at the time of its completion in 1926 the longest suspension bridge in the world. Population, 1930, 117,172.

The Dutch commander De Vries was the first white man to visit the site of Camden. Seven years later, the locality was settled by a colony of Swedes, who named it Aquikanasra. In 1681 William Cooper, an English emigrant, purchased large tracts of land from the Indians, within the present limits of the city, and in 1763, Jacob Cooper, one of his descendants, laid out a plot of forty acres as a town site, naming it for the Earl of Camden.

A Quaker settlement along the river at this point, where there was a crossing, was organized in 1773. During the Revolution, the city was a center of military activity, and for a time it was occupied by the British. It became a city in 1828.

Railroads. Camden is the terminus of the Atlantic City and the West Jersey & Seashore railroads and of divisions of the Pennsylvania Railroad. The Atlantic City line is a part of the Reading system.

Industry. "Camden makes everything from a pen to a battleship," is a slogan of the city. It supplies most of the world's steel pens, and has one of the largest shipbuilding yards in the world. The Victor Talking Machine, Campbell Soup, and Congoleum factories are located here. In all, there are about 350 industrial enterprises. L.D.O.

CAMEL. This beast of burden is often called "the ship of the desert," a romantic name that it well deserves. Were it not for its ability to endure long, hard journeys over the desert sands, vast areas in Asia and Africa would never have been opened to commercial intercourse and travel. But in appearance, the camel is about the most unromantic creature on earth. It could take a prize in ugliness without trying. The small, ill-shaped head at the end of the awkward neck, the slanting nostrils, protruding eyes, and loosely hung jaws, the ungainly legs and the uncouth humped back, make a combination as grotesque as nature ever created. As a servant of the desert tribes, however, the camel is as superbly fitted for its work as the dog of the Eskimo in regions of eternal cold.

Why the Camel Is So Useful. The camel of one hump, called *dromedary* and *Arabian camel*, makes its home in Arabia, North Africa, and

India; the two-humped *Bactrian camel*, which has shorter legs and a stockier body than the dromedary, is domesticated over a large area in Central Asia. In both species, the humps are solid structures, formed mostly of muscle and fat. They are, in fact, real provision boxes, for the food elements contained in them supply the camel with nourishment when, as often happens in the desert wastes, the animal must go for days without eating. When a caravan of camels leaves for a trip across the desert, the humps are hard and filled out, but at the end of an arduous journey they usually appear lean and shrunken. The camel is not particular about its diet. Its long, yellow teeth can chew anything from leather to thorns and thistles, and nothing seems to give the animal indigestion. Hard, dry vegetables, shrubs, twigs, and anything else it can get its teeth into make up the larder of the camel. This strange animal reaches for its food with its upper lip, which is split through the middle.

Besides carrying its provisions along with it, on its back, the camel has a special arrangement for carrying surplus water. In the walls of its stomach there are numerous little pouches which hold water and enable it to go for days without drinking. It also knows how to brave the dust storms which sometimes sweep over the sandy plains. In such storms, it kneels down, stretches out its long neck, and closes its slitlike nostrils, providing a shelter, perhaps, for its defenseless master. From the hard sand itself, the camel is protected, for on its chest and knees are cushion-like pads of tough, elastic tissue. The feet consist of two toes, both of which rest upon a single padded sole. Thus the animal is comfortable when it kneels down and when it walks on the shifting sand. Camels and their riders cross the deserts in caravans, which are sometimes miles in length. The camel is not fully grown until its sixteenth or seventeenth year, but it is trained from its fourth year to kneel, to rise, and to carry bur-

dens. A mature camel will carry a load of a thousand pounds. An ordinary camel will carry its pack twenty-five miles a day for three days without water; some will go without water

fifty miles a day for five days. A specially trained camel will carry a rider a hundred miles in a day. Like a pacing horse, it lifts the legs on the same side at the same time, and it has a rocking gait that some riders find very uncomfortable.

To the people who live in desert countries, the camel is valuable in many other ways than as a beast of burden. The two-humped camel grows a very long winter coat, from the hair of which the natives weave cloth. Fine blankets and coat materials are also woven from camel's hair. The Arabs use camel's-hair cloth, especially for tent coverings, and we read in the Bible that John the Baptist "had his raiment of camel's hair." The meat of the young animal resembles veal, and is a favorite with the Arabs, who also drink

milk of mother camels. A very durable leather is made from the hide. Artists in America and Europe use fine camel's hair for their brushes.

Disposition. The camel is not, like the horse, an animal that learns to love and serve its master intelligently. It can be trained to kneel for the load and to rise for the march, but it is obedient only because it is too stupid to be otherwise. No matter how long a camel works for one master, it remains a dull, sullen, ill-tempered servant, domesticated but not tamed. If overtaken by a fit of anger, a camel will begin to bite and kick with great ferocity, whether it has provocation or not. It whines and protests when commanded to take a load, but once started it stupidly carries on, a weird, ungraceful figure, doing a work that no other animal could ever accomplish.

Origin. Camels have been domesticated for so many centuries that there are no records of their life in the free state. It is a widely



Photo P & A

YES, IT'S A CAMEL

This baby, only a few days old when it posed for a photograph, was the heir to all the worldly goods of Mr and Mrs. Turk al Bahr. The parents were presented to the zoo at San Diego, Calif., by the Order of the Mystic Shrine



Everything about the camel is admirably fitted to his way and place of living. His neck and legs are long and powerful, the legs terminating in wide flexible feet, veritable pads that prevent sinking into the sand. His brown eye is set well out in a roomy socket, giving him the needed wide range of vision. His narrow nostrils protect his lungs in the wind-swept desert, and his matted body hair is excellent insulation for his vital organs in the extremes of heat and cold he encounters. His knees and breast are equipped with thick pads, perfect protection for kneeling. In the hump he carries a food reserve sufficient to keep him alive through a long foodless journey.

The Dependable "Ship of the Desert." The nose ring, by which the camel is guided by his driver. Footpads and kneepads. Waiting to receive their loads (a scene on the edge of the desert). Below, a fine Bactrian specimen, at home in a zoo.

accepted theory that the first camels or camel-like animals lived in North America, thousands of years ago, when a large part of the continent



Photo Visual Education Service

PRAYER IN THE DESERT

As important in the picture as the attitude of humility of the man is the method of hitching the camel so he will not wander away. Note also how the load is balanced.

was desert. When the climate became more humid and forests grew, these animals are supposed to have migrated. Some crossed Siberia into Asia, others went to South America, where their descendants survive as llamas, alpacas, and vicuñas. Though the llama lives in the mountains, where it has plenty of water, it has a stomach like the camel's, capable of storing water. At the time of the rush to California of the gold-seeking "forty-niners," camels were brought to America for use in crossing the desert, but this experiment was not a success.

W.N.H.

Scientific Names. Camels belong to the family *Camelidae*. The Arabian is *Camelus dromedarius*; the Bactrian, *C. bactrianus*.

Related Subjects. The reader is referred in these volumes to the following articles

Alpaca	Llama
Dromedary	Vicuña

CAMEL BIRD, the name given by ancient peoples to the ostrich (which see).

CAMELLIA, *ka mel' ih ah*, a beautiful, waxy, roseline flower which is borne on a plant closely related to those which yield tea. The leaves of this plant are dark green, shining, and laurel-like, and serve to set off most effectively the large blossoms. The common camellia, now much grown in greenhouses in America, is native to Japan, but there the flowers are single and usually red, while with the development of varieties for cultivation, they have doubled and have developed various colors, including white, pink, reddish, and yellow. For

best results, camellias should be planted in a loose, black mold in a cool greenhouse, and given plenty of water, free from lime. Although they will grow from seeds, the finest specimens are produced by grafting. Dumas' famous novel, translated into English as *Camille*, was called in the original *The Lady of the Camellias* (see CAMILLE). The common camellia is also known by the name of *japonica*. B.M.D.



CAMELLIA

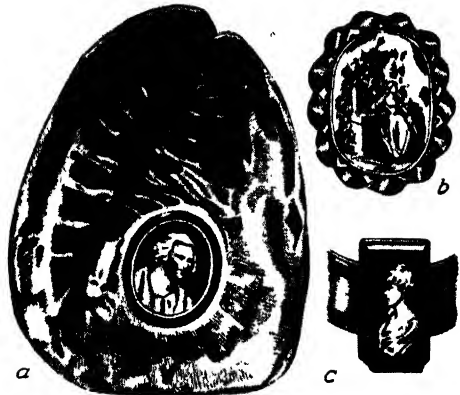
Scientific Name. Camellias belong to the family *Theaceae*. The common species is *Thea japonica*.

CAMELOPARD, *kam el' o pahrd*. See GRAPPE.

CAMEL'S HAIR. See MOHAIR.

CAMEL'S HUMP, *THE*. See VERMONT (The Land).

CAMEO, *kam' e o*, the general name for all precious stones which are engraved with raised figures, in contrast to *intaglios*, which have the figures sunk below the surface. In a special sense, the term *cameo* is applied to a gem



CAMEOS

(a) Sardonyx shell with portrait cut in bas-relief; (b) cameo brooch; (c) cameo ring.

which has layers of different colors, with the figures so engraved that they appear in one color and the background in another. Onyx, sardonyx, and agate are the stones in general use for cameos, but very beautiful artificial specimens are produced from various kinds of shells and fine glass. Shell in particular yields cameos of rare delicacy. A famous

specimen of an imitation of cameo in glass is the Berberini Vase in the British Museum, made at Rome about the first century before Christ. This has a blue background and figures of a delicate, half-transparent white. Both the Greeks and the Romans excelled in the art of cameo-cutting. See INTAGLIO; GEMS. T.B.J.

CAMERA, *kam' ur ah*, the popular name for any apparatus used for taking pictures by photography. The term is really the Latin word for *chamber*, and is abbreviated from *camera obscura*. The camera obscura works exactly like the human eye. In the eye, the crystalline lens reflects upon the sensitive retina any rays of light coming from the outside; in the camera obscura, the rays are reflected upon a screen placed in a darkened chamber, just as the retina is in a darkened chamber of the eye. In the ordinary photographic camera, the place of the screen or retina is taken by a sensitized celluloid film or glass plate. The film or plate is previously prepared so that it will preserve the image of any objects reflected on it.

There are as many different kinds of cameras as there are purposes and personal tastes. The essential parts, however, are few and are easily remembered—the box, the lens, the shutter, and the screen. The box is fitted with a telescopic arrangement, made of light-proof cloth, rubber, or other material, by which the lens can be placed at a proper distance from the screen.

At the outer end of this telescope arrangement is a frame in which the lens is set; at the other end, at the back of the box, is the screen. In large cameras, such as those used by professional photographers for taking portraits, a piece of ground glass, in a frame, is used as a screen. The photographer moves the lens backward and forward until the image on the screen is clear. Then he is ready to remove the screen and substitute the sensitized plate. He covers the lens with a cap, which usually contains a shutter. The speed with which the shutter opens and closes can be regulated to a fraction of a second, and the size of the opening is also adjustable. The period during which the shutter is open is called the *exposure*, for the sensitized plate is exposed to the rays of light which pass through

the lens. A large camera is usually mounted on a tripod when in use, to keep it motionless during the exposure.

The smaller, or hand, cameras are exactly the same in principle, though slightly different in details of manufacture and operation. Large cameras, with glass plates, are not easily carried around. The first notable improvement was the substitution of sheets of celluloid film for glass. These sheets were separated by black paper, and when a film was exposed it was withdrawn from the camera together with its protecting black paper. The film "packs," as they were called, were not entirely satisfactory, and the latest cameras all use films in rolls.

The entire roll, mounted on a spool, is inserted in the camera, and as it is exposed bit by bit, is gradually rolled up on a second spool. The roll of film is protected from the light by black paper.

Small cameras also differ from large ones in the method of adjusting the lens and making the exposure. They have an additional pair of lenses, called the *finder*. These are mounted outside the telescopic arrangement and have no connection with the photographic lens; they are in the same relative position, however, and anything visible in the finder will appear in the photograph. In nearly all types of cameras the shutter is controlled by a spring, which may be released by pressure on a lever or on a rubber bulb which in turn releases the lever.

Uses of the Camera. The camera is now used in almost every art and industry. Photo-engraving is perhaps its most important commercial use, but there are dozens of other processes and industries in which it plays a part. Special cameras, both large and small, are made for particular purposes. The solar camera, for example, is used in connection with a telescope to photograph stars and planets not visible to the naked eye. At the other end of the scale are cameras specially made for scientific research with the microscope.



THE FAMILIAR HAND CAMERA



CAMERA USED BY PHOTOGRAPHERS

Then there are the *multiplying* camera, in which a number of lenses are used for taking several pictures at one time; the *stereoscopic* camera, a double camera for giving a double picture on one plate; the *copying* camera, used for copying photographs from negatives; and the *cyclo-ramic* camera, which turns on a central pivot and takes a panoramic view at a single exposure. One of the most remarkable types of cameras is that used for taking moving pictures. For further details of the use of cameras, see PHOTOGRAPHY (Amateur Photography).

The Camera and the Eye. In the article EYE will be found illustrations further explaining this subject.

Related Subjects. The reader is referred in these volumes to the following articles:

Astronomy	Lens
Camera Lucida	Moving Pictures
Camera Obscura	Photoengraving

CAMERA LUCIDA, *lu'-suh dah*, literally a *light camera*, a simple instrument used for sketching objects seen through a magnifying glass. It consists of a four-sided prism, having two sides at right angles, and the other two at an oblique angle, and a magnifying glass, both being attached to a frame in the position shown at the left in the illustration on the following page. The light from the object enters the prism and is reflected at *a* to the point *b*, where it is reflected to the lens, through which it passes to the eye. The magnified image is thrown upon the paper where the sketch is made. Another form, shown at the right in the illustration, uses a right-angled prism with a sheet of glass for a reflector. But the form first described is in most general use. The camera lucida is used for sketching parts of insects, the cell structure of plants, and other very small objects. It is seldom seen outside biological laboratories. See illustration, page 1109.

CAMERA OBSCURA, *oh sku' rah*, literally a *dark chamber*, is a box arranged for sketching landscapes and other large objects. The box contains a mirror, *a*, set at an angle of 45°; a double-convex lens (see LENS), such as is used

in a photographic camera, is placed in the front end, and the top has a lid which can be raised. Under the lid is a ground-glass screen. The image of the object is formed on the mir-

ror and reflected upon the screen, where it can easily be sketched with a lead pencil. The instrument should be used in a dark room, or a black cloth should be thrown over it and the head and shoulders of the one making the sketch, for otherwise the image will be too dim to admit of sketching.

Before photography became so common, the camera obscura was in general use by artists in making sketches for illustrated papers and magazines. See illustration, page 1109.

CAMEROON, *kah ma-roon'*, formerly also spelled KAMERUN, a German possession in Africa until 1914, which was captured by British and French troops during the World War and later mandated to Britain and France by the League of Nations for government. It lies between French Congo on the east and British Nigeria on the west, and extends from the Atlantic coast northeastward to Lake Chad. It is roughly triangular in shape, with the northern extremity the apex. The British section borders on Nigeria, on the west, and reaches northward to Lake Chad. Its area is 31,000 square miles, and the population is nearly 660,000, of whom fewer than 100 are Europeans. The French section, to the east, is larger, about 167,000 square miles

in extent, and the population exceeds 1,500,000; about 300 are white. The natives are Bantus, near the coast, and Sudanese negroes.

The coast region has a fertile soil, and there are valuable plantations of cacao, coffee, and rubber. There is also an active trade in palm oil and ivory. The colonies are rich in hardwood, and ebony is abundant. Iron and gold are found, and cattle-raising is successfully carried on. There are about 150 miles of railway lines in operation. See BANTU; MANDATED TERRITORIES.

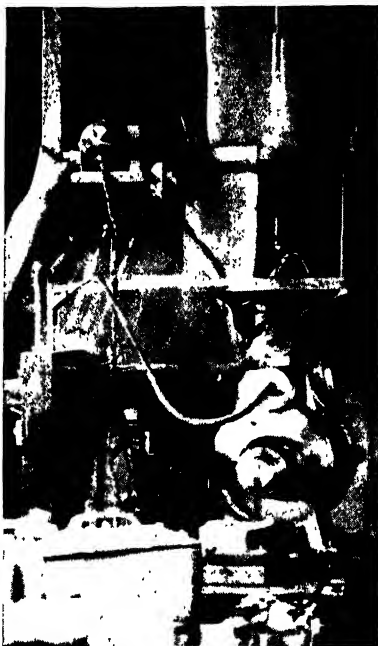
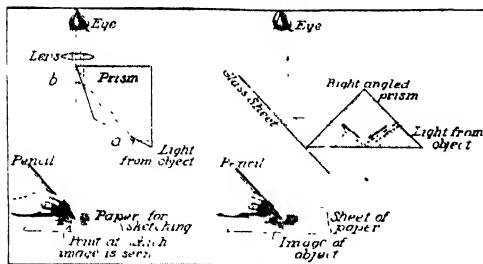


Photo P & A

TAKES A PICTURE IN A MILLIONTH OF A SECOND

A photographic device that operates so quickly that it reveals what occurs in a millionth of a second, or even a fraction of such a brief interval, has been perfected, and is being used in studying the effects of lightning on electrical apparatus and in developing ways to prevent damage from such electrical disturbances. In spite of the minuteness of the time involved, the instrument, known as the Dufour cathode ray oscillograph, records precisely what happens when lightning strikes a transmission line, or when a lightning arrester operates. The device is based on the facts that electrons can be deflected by either electromagnetic or electrostatic fields, and that electrons striking a photographic film would produce the same photographic effect as that produced by a beam of light.

CAMILLE, *ka meel'*, the title and the name of the heroine in the English version of a celebrated play by Alexandre Dumas the Younger. The play created a sensation when produced in Paris in 1852, and has since en-



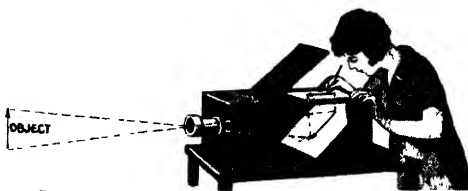
CAMERA LUCIDA

joyed great popularity in English-speaking countries because of the opportunity it gives for display of highest emotional power. Sarah Bernhardt, Olga Nethersole, and Helena Modjeska have all been notable Camilles. Verdi's popular opera *La Traviata* is based on the story of Camille. See **OPERA** (Some of the Famous Operas).

CAMOMILE, *kam' o mile*, a variant of chamomile (which see).

CAMORRA, *ka mahr' ah*, a Neapolitan secret society of criminals which for about a century

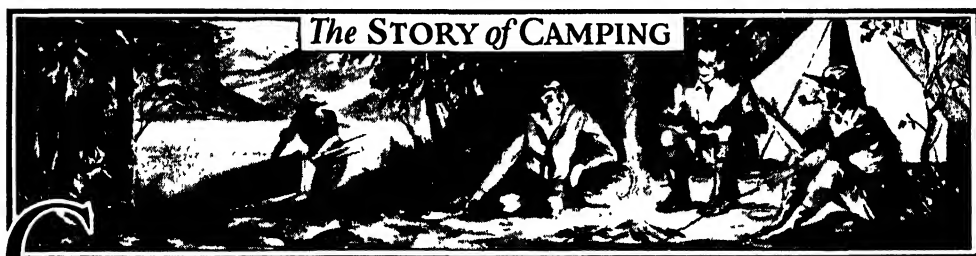
was very active in extorting money by threats of violence. For a time during the Bourbon rule (before 1850), the members of the society, called *Camorristas*, worked openly, agreeing to commit crimes of any sort for a money pay-



CAMERA OBSCURA

ment. Under the rule in Italy before Fascism, they formed a political machine, in complete control of the city of Naples, but at the election of 1901 a citizens' league drove the Camorristas from power. It is believed that a final blow at the Camorra was struck in 1912 when six of its members were tried for murder and twenty-five others were accused of being members of a criminal society. The result was a verdict of guilty against a number of Camorristas, who received sentences of imprisonment ranging from four to thirty years.

CAMOUFLAGE, *kam' o flahj*. See **WORLD WAR** (Submarines in the War); **SUBMARINE** (Protection of Ships).



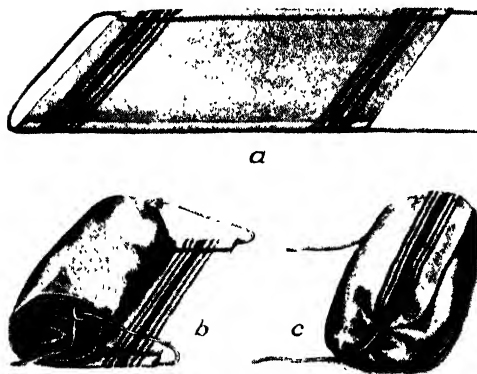
CAMP. The words *camp* and *camping* suggest many things—woods, prairies, mountains, lakes, rivers, fishing, hunting, rest for tired nerves, out-of-door life. Camping includes everything from spending the night in a tent in your own back yard to passing several weeks in some secluded spot, miles from the nearest town. The camper may travel on foot, on horseback, in a wagon, or in an automobile. He may use a canoe, a sailboat, a motor launch, or a steam yacht. No matter where or how one goes, the thought of camping should act like magic, should make one restless for the freedom of out-of-doors, and for the strength and vigor which only an outdoor life can give.

There is only one way to get the real flavor of outdoor life; it is to get into the wilds, away from the cities. This does not mean that the boy or girl who has been brought up in a

large community cannot learn a great deal about camping without going many miles from home. Much can be learned from books and by practice; many experiments in making shelters and beds, building fires, and cooking can be tried before the camping trip begins. In fact, it is wrong for the inexperienced person to start with the idea that only experience in the woods or the mountains can teach him. Experience will teach him confidence and many things which are not found in books, but a little early information will make his experience more pleasant.

Equipment. The amount of equipment to be carried is largely a matter of personal preference. It is desirable to reduce the weight to a minimum, especially if the camping trip includes long walks. If horses or canoes are used, the amount may be slightly increased,

but the real camper has no desire to make a pack horse of himself. He quickly learns to get along without some of the things which make his back and shoulders weary when he carries them day after day. It is not a bad plan for the beginner, when he returns from his first long trip, to sort his equipment into three piles—one, of the things he used every day; one, of those he used at least once; and



HOW TO FOLD AND ROLL A PACK

(a) Blanket with edges folded over rope; (b) blanket partly rolled, showing method of making loops; (c) pack rolled up.

one, of those he did not use at all. On his next trip, this third class should be left at home, and the second class, too, if possible. The only possible exception to this arrangement is the first-aid-to-the-injured kit.

Clothing. In the matter of clothing, each person must be the judge of what is needed. Any old suit will do for daily wear for a boy or man, although knickerbockers are useful. A woman should wear a short woolen skirt or knickerbockers. Some campers wear corduroy, because it is warmer and more durable. Woolen shirts are better than cotton, because they dry rapidly if they get wet, and they keep the body at a more even temperature. Woolen or heavy leather gloves are useful in nearly any kind of weather. Hats should have small brims, but many campers prefer to use caps, which are less likely to blow off in a high wind or catch on overhanging branches. Shoes should be waterproof, if possible, and should be a trifle easier and larger than ordinary street shoes. Some experienced woodsmen wear moccasins, which allow a better grip on slippery surfaces.

Every camper should have a waterproof canvas bag in which to keep extra clothing and other personal supplies, although few go to this trouble. Four pairs of woolen socks, two flannel shirts, two sets of woolen underwear, one suit of pajamas, one pair of trousers, and a woolen sweater will be all the extra clothing needed on a trip through the woods in the

spring and autumn. An extra pair of shoes, a pair of moccasins, some thread, needles, scissors, a toothbrush, several towels, and a notebook can all be kept in the bag.

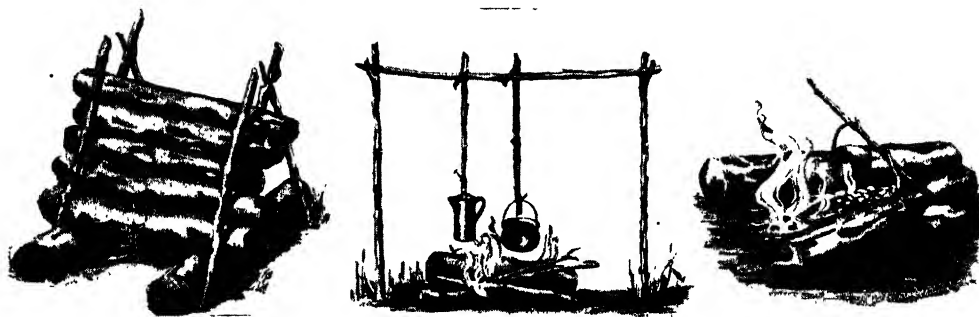
Camp Supplies. In the amount and kind of supplies, there is a very wide range. Catalogs of sporting goods are filled with all sorts of devices, some of them really valuable, some of them quite unnecessary. A combination knife, corkscrew, and can-opener is most useful, but an experienced camper will make a good pocket knife do the work of all three; a hunting knife and small ax are also indispensable. Cooking kits are offered in endless combination, but a small, empty lard pail, a small frying pan, a tin cup, a knife, fork, and spoon are enough for the simplest camping. A supply of nails, heavy twine, and wire will often prove useful, and every party should have at least one compass and one waterproof matchbox. A magnifying glass, a field glass, and a camera are non-essentials, but will add greatly to the pleasure of a trip.

Food. Camp food is almost entirely a matter of personal choice. Fruits and vegetables can be bought dried or canned; milk is obtainable either condensed in cans or as a powder; and soups are now available in the same forms. If the camp is not too far from habitation, an occasional supply of fresh meat, eggs, butter, etc., will gratify the appetites of the campers. Coffee, cocoa, bacon, and cornmeal cakes are the staples of camp cooking, but bacon is the most important of all.

Proper Location for a Camp. Few people believe that a camp is really a good one unless it is on or near water. The temptation to camp on the very edge of a lake or a stream is always strong, but it should be resisted because the low ground is almost sure to be damp, and is frequently infested with mosquitoes and other insects. If there is no high land near the shore, the best place for a camp is some point projecting into the water. Here the currents of air will probably be strong enough to keep insects away.

If a choice can be made between two locations, one near firewood and the other near water, the latter is likely to be more picturesque, but the former involves less work. It is much easier to carry water than wood. If the camp is more or less permanent, involving the use of tents, ground sloping to the south is best, for the open end of the tent can then be placed so that the sun's rays will reach the interior. A camp should never be made, if avoidable, in dense woods, where falling limbs are dangerous, nor in a hollow, which will collect water after a rain. Dead wood and heavy underbrush are breeding-places for mosquitoes, and they retain dampness.

Camp Fires. The experienced camper starts a fire as soon as the camp is located, and one



HOW CAMP FIRES SHOULD BE BUILT

At left, night fire; at center and right, fires for cooking.

glance at a fire will tell just how much camping experience the builder has had. There are many ways of building a fire, and as many ways of arranging and supporting the pots and pans. If a high wind is blowing and the camp is somewhat unprotected, it is wise to dig a fire hole, so that the live coals will not be blown away. Another simple method is to build the fire in a V-shaped space protected by two logs. The logs should be smoothed off on top, so that frying pans and other utensils may be set on them. At the open end of the V, the fire should be kept burning briskly, and here the kettle of water may be set to boil. At the closed end of the V there should be a bed of coals, and here the frying and baking should be done. Instead of two logs, two rows of flat stones may be used.

In permanent camps it is customary to make racks on which to hang kettles and pots over the fire. Three pieces of lead pipe, for example, can be wired to make a firm support, but two upright forked sticks, with a third laid across them, make a satisfactory substitute. The simplest and in some ways the best method is to hang kettles on a long trailer resting in the crotches of forked uprights, as shown in the illustration. Such a trailer can be shifted by one person.

If a fire is being built to provide warmth, one of the best methods is to lay it between two large logs laid parallel. One of the approved ways of building a fire to give heat for a night is illustrated herewith. Two green stakes should be driven into the ground nearly perpendicular. Two heavy logs, for fire-dogs, may be laid at right angles to the line between the stakes. Logs may then be piled against the stakes to any height, and two more stakes driven to hold them in position. As each log burns away, the others will drop down, and the fire will burn as long as logs remain above it.

Building a fire is not difficult in dry weather, but if it is raining, the camper may experience trouble. If some dry wood cannot be found under the trees, search should be made for a dead cedar. Cedar splits easily and burns

quickly. After the wood is split, some of the smaller pieces should be piled up in the form of a hollow pyramid, with shavings stuffed inside it. Dry birch bark or dead twigs on the lee side of a tree can generally be found, if a cedar is not available; but if nothing else is at hand, it may be necessary to chop into a fallen tree for dry shavings. The fire should be built on the lee side—that is, the side protected from the wind—of a boulder or clump of trees. In the winter, it is best not to build a fire under a tree covered with snow, as the heat will melt the snow and the water may put out the fire. The inexperienced camper frequently gathers too little firewood; it is better to gather too much than to leave the cooking at a critical stage or to get up before daybreak to hunt for wood to keep the fire going.

As a general rule, hard woods are the best for camp fires. Hard woods make a slow-burning fuel which yields lasting coals, whereas softwoods give a quick, hot fire that soon dies out. The following woods burn scarcely at all, if they are wet or green: aspen, black ash, balsam, box-elder, sycamore, tamarack, and poplar. Chestnut, red oak, and red maple burn slowly when green. All soft pines crackle, and embers are likely to shoot off. Some of the hard woods, such as sugar maple and white oak, shoot off long-lived embers, and must be watched for some time after the fire has started. The best of firewoods is hickory, either green or dry. It makes a hot fire, and burns down to a bed of coals which keep an even heat for hours.

Shelter. If the weather is clear and fine, no camper will want a shelter. Man has not yet produced anything more restful than a bed of pine boughs under a clear, star-lit sky. But there are many days, even in summer, when some protection is advisable. If the rain is not falling too hard or the wind is not too strong, there is no better shelter than a pine grove. The needles which have fallen to the ground make the softest of beds, and the interlaced branches overhead keep off the rain. The simplest shelters suitable for a tempo-

rary camp are made of brushwood. These can be made in any shape to suit the preferences of the campers, but the lean-to is the only practicable brush camp if there are more than three persons in the party. Two crotched sticks should first be driven upright into the ground, about eight feet apart, and a stout sapling



METHOD OF PREPARING A SHELTER

laid across them; the sapling may also be laid in the crotch formed by a branch of a standing tree. On this crosspiece should be leaned a number of saplings or poles, the lower ends of which may be secured by sticking them into the ground or by rolling a log against them. On this framework should be laid boughs of hemlock or spruce, or other heavy brush, which should be lapped like shingles, so that they will shed the rain. If the shelter is built on sloping ground, a trench should be dug at the back and sides to carry off the rain.

Many campers carry portable tents or waterproof canvas sheets which can be stretched for shelter. These are good, the only objection to them being that they are heavy and are an unnecessary addition to a pack which is probably heavy enough. Tents, however, are essential to comfort, if the camp is to be permanent. For different kinds of tents and their uses, see TENT.

Camp Discipline. Camp life is an intimate association of people, and probably nothing else so fully discloses strength and weakness of character. Especially in a large camp, there is likely to be some difference of opinion on all matters. If these differences are merely friendly, no harm is done, but there is always the possibility of serious misunderstanding or quarrels. For this reason, the most successful camp is invariably one in which all the mem-

bers submit cheerfully to an informal discipline established by one or two of the older and more experienced members. For example, if one of the campers wants breakfast at eight and all of the others want it at seven, the advocate of a late breakfast should yield without argument. If most of the party want to spend a day fishing, a minority should not spoil the sport by grumbling about partridges or ducks. If the camp is very large, it may sometimes divide into several parties—one for fishing, one for hunting, one for tramping, etc.

In summer camps for boys and girls, discipline means submission to rules which the camp counselors or masters have adopted. Certain hours of the day should be fixed for meals, for swimming and bathing, for cleaning camp, etc., but some time should also be left free. Each member should do a required share of the work. Shirkers, whether they are young or old, boys or girls, men or women, are not wanted in a real camp. More than anything else, cheerfulness is the essential of a good camper, a cheerful "tenderfoot" is infinitely better than a sulky veteran.

CAMP, WALTER (1850-1925), for years one of the leading American authorities on amateur athletics, sometimes called the "dean of American football." The name of Walter Camp is probably familiar to every boy who has been interested in the great autumn sport. His interest in athletics dated from his undergraduate days at Yale University, where he played on the university football and baseball teams, rowed in his class crew, won the high hurdles, and represented Yale (with Slocum) in the first Intercollegiate Tennis Meet. After his graduation in 1880, he was active in the management of Yale athletics, and became chairman of the athletic committee. He gradually became recognized as the leading authority on football, and was for years a member of the football rules committee and its secretary, as well as editor of the committee's official organ, *Spalding's Football Guide*. Each year he selected an "All-America" football team, composed of the star players of the different colleges.

His Books. Camp's intimate knowledge of schools and athletics was used to advantage in books written primarily for boys. These are among the most popular of all juvenile books, and include *The Substitute*, *Jack Hall of Yale*, *Old Ryerson*, and two *Danny Fists*



Photo. Harris & Ewing

WALTER CAMP

series. He also wrote the *Book of College Sports*, *American Football*, *Football Facts and Figures*, and *Training for Sports* (in 1921). In the year last named, he published Camp's *Daily Dozen*, a series of physical exercises.

CAMPANILE, *kahm pah ne' lah*, from the Italian word for *bell*, is the name given to the old bell towers belonging to the churches of Italy. They were built for the same purpose as the steeples of ordinary churches—to hold the bell which by its ringing should assemble the worshipers; but they differ from steeples in that they are not a part of the churches to which they belong, but form separate buildings, though sometimes there is connection by a passageway of arcades.

Among the most famous examples are the campanile of the cathedral at Florence, designed by Giotto in the fourteenth century and faced with red, white, and black marble; and the Leaning Tower of Pisa, inclining almost fourteen feet from the perpendicular. Saint Mark's campanile, possibly the most notable of all, was 302 feet high and a landmark of Venice for over a thousand years, dating from A.D. 900. In 1902 it collapsed; work of restoration began in 1905, and the new campanile, shown in the illustration, was completed in 1912. See PISA, LEANING TOWER OF; SAINT MARK'S, CATHEDRAL OF.

CAMPANINI, *kahm pa ne' ne*, CLEOFONTE (1860-1919), a famous operatic conductor and manager, born at Parma, Italy. After completing courses in music at the Royal Conservatory in Parma, Campanini became musical conductor of the Parma Opera, and in 1883 was engaged as assistant conductor for the first season of Italian opera at the Metropolitan Opera House in New York. Subsequently, in Naples, Venice, and Rome, he established his position as a great operatic conductor, and from 1897 to 1906 was with the Covent Garden organization in London. After 1906 he became identified with American

operatic performances, directing the Manhattan Opera Company of New York from 1906 to 1909, and the Chicago Grand Opera organization from 1910 to 1913. In 1913 he succeeded Andreas Dippel as general manager of the company. Campanini died in Chicago in 1919. He was an outstanding personality in the operatic world, having unerring technique in directing productions of every school of opera.

CAMPANULA, *kampan'u lah*, from the Latin *campana*, meaning *bell*, the name of a genus of plants which bear nodding, bell-shaped flowers, white, blue, or lilac in color. Probably the favorite species is the slender little *harebell*, also called the *bluebell of Scotland*, which grows in meadows and on rocky hillsides, and is also found high up on the mountain slopes (see SCOTLAND; BLUEBELL). The more showy varieties of campanula, such as the Canterbury bell, are popular in gardens, and are especially effective as border flowers. Those species that blossom year after year may be planted from young cuttings in the spring or from seeds. They are easily cultivated. Campanula is the type genus of the family *Campanulaceae*. See illustration of the plant, page 1114. B.M.D.



CAMPANILE OF SAINT MARK'S

Noblest of all of Italy's campaniles, its walls rise 300 feet, in a series of eight stories pierced by windows. Above the platform rises an open loggia (gallery) fifty feet high, in which is the belfry. The total height of the structure is 325 feet.

CAMPBELL, ALEXANDER. See DISCIPLES OF CHRIST.

CAMPBELL, SIR COLIN. See SEPOY REBELLION.

CAMPBELL, THOMAS (1777-1844), a noted English poet, best known to general readers for his stirring lyrics *Hohenlinden*, *Ye Mariners of England*, and *The Battle of the Baltic*, and his ballad of *Lord Ullin's Daughter*. Certain lines from his poems have become so familiar that they are everywhere quoted, without thought of their source. Such are—

'Tis distance lends enchantment to the view.

Like angel visits, few and far between.

Coming events cast their shadows before.

Campbell was born and educated in Glasgow, and while in the university in that city



COUNCIL OF THE CAMP FIRE GIRLS

The Guardian of the Fire elevates the Wood Gatherer to the rank of Fire Maker

won a reputation by his poetical translations from the Greek. From 1820 to 1830 he edited the *New Monthly Magazine*, and in 1826 was made lord rector of the University of Glasgow. He was buried in the Poets' Corner, Westminster Abbey.

Other Works. The chief of his later works, besides those mentioned above, were *Gertrude of Wyoming*, a narrative in verse of the Wyoming Valley Massacre in Pennsylvania, and an anthology called *Specimens of British Poets His Pleasures of Hope*, published in 1799, made him immediately famous and won him a pension of \$1,000 a year

CAMPBELL, WILLIAM WILFRED (1861-1918), a Canadian whose lyrics on the lake region won him the title "The Poet of the Lakes." He was born at Kitchener (then Berlin), Ont., educated at the University of Toronto and the Episcopal Theological Seminary at Cambridge, Mass., and for six years was an Episcopal clergyman. In 1891 he retired from the Church and secured a position in the civil service at Ottawa. His first volume was *Lake Lyrics and Other Poems*. *The Mother*, which came out in April, 1891, is said to have

received more notice than any other single poem that ever appeared in the Canadian press. See CANADIAN LITERATURE (English Canada).

What He Wrote. Among his later works are *The Dread Voyage* and *Beyond the Hills of Dreams*, two volumes of verses; *Mordred* and *Hildebrand*, dramas, *A Beautiful Rebel*, an historical novel; and *The Scotsman in Canada*. He also edited the *Oxford Book of Canadian Verse*.

CAMP FIRE GIRLS. This organization for girls lays emphasis upon out-of-door life, but has as its central purpose the awakening of a realization of the beauty and dignity of home-building and home-keeping. Fire, the symbol of the home, of service, and of romance, is the chosen emblem and the theme of the song which is part of each ceremonial gathering:

Whose hand above this blaze is lifted
Shall be with magic touch enkindled,
To warm the hearts of weary mortals,
Burn, fire! Burn!

The association's watchword and call, *Wohelo*, is formed from the first two letters of Work, Health, and Love, and the symbol of membership is the standing pine, signifying strength and simplicity.

There are three degrees of membership, known as Wood Gatherer, Fire Maker, and Torch Bearer. These ranks are attained by meeting certain requirements and winning a specified number of honors selected from the divisions of health craft, home craft, nature lore, camp craft, hand craft, business, and patriotism. The records of attainments are

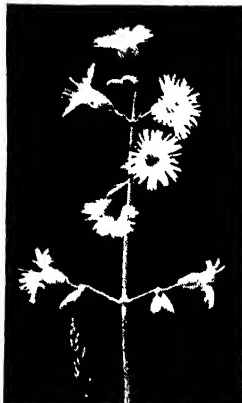


Photo: Visual Education Service
CAMPANULA

kept by each girl in the form of wooden beads, given as awards for winning different honors, and colored to represent the craft in which the honor is won; for example, orange, or fire-color, represents home craft; red, the color of blood, represents health craft, etc. These beads are worn with the ceremonial costume.

The prime law of the organization, which every girl holds before her as an ideal, is as follows:

Seek beauty	Hold on to health
Give service	Glorify work
Pursue knowledge	Be happy
Be trustworthy	

In order to become a Wood Gatherer, a girl must know this law, fulfill other definite requirements, and must have at least fourteen honors distributed among the seven crafts. At the time of awarding each of the three ranks, a "desire" is voiced; the Wood Gatherer expresses hers in the words:

As fagots are brought from the forest,
Firmly held by the sinews that bind them,
I will cleave to my Camp Fire sisters
Wherever, whenever I find them.
I will strive to grow strong like the pine tree,
To be pure in my deepest desire;
To be true to the truth that is in me,
And to follow the Law of the Fire

In order to advance to the degree of Fire Maker, a girl must show that she is dependable and able to bear responsibility, and must show evidence of achievement and knowledge in various things, such as preparing and serving meals, sewing, observation of health laws, interest in community welfare, first aid, and keeping a classified account of the money received and spent for one month. She also learns the "desire" of the Fire Maker, in the form of the following chant:

As fuel is brought to the fire,
So I purpose to bring
My strength,
My ambition,
My heart's desire
My joy
And my sorrow
To the fire
Of humankind
For I will tend
As my fathers have tended,
And my fathers' fathers
Since time began,
The fire that is called
The love of man for man,
The love of man for God.

The greatest honor a Camp Fire Girl can attain is the rank of Torch Bearer. She must have earned additional honors and fulfilled specified requirements, but in addition, she must have proved herself to be a leader and a responsible member not only of her own group, but of her community. She must be able to

say, when she receives the symbol of the rank, "That light which has been given to me I desire to pass undimmed to others."

Any group of at least six girls, eleven years of age or older, who wish to become Camp Fire Girls may do so by selecting a woman over eighteen years of age as Guardian and writing to the national headquarters in New York City for an application blank. When this has been properly filled out and the national dues of one dollar for a member have been earned, and both have been sent in to headquarters, a group charter and Guardian's certificate are sent to the Guardian, with detailed programs for the first meetings. The Camp Fire circle was organized in 1911 by Luther H. Gulick and his wife, and has since spread over the United States and into ten foreign countries, with a membership of over 165,000. Many schools and churches have adopted the Camp Fire system for their clubs of adolescent girls.

The Camp Fire program aims to make knowledge, the capacity for leadership, and the ability to do useful things desirable and attractive, and helps to attain this end by its system of awarding honors for more than eight hundred fifty different achievements in the seven crafts. Homely, necessary things attain new dignity under the stimulus of awards and comradeship in the work. Great emphasis is laid on outdoor life and camp craft; many groups camp out for some time each year, and gypsy hikes, swimming and skating parties, and other outdoor activities are regular parts of the Camp Fire program.

The symbolism and ritual which are vital parts of the system are evident in all the procedure which is described above. Besides the group symbolism, each girl chooses for herself a name which expresses her ideals or ambitions; she also designs her own symbol, which may represent her name. She usually chooses primitive American Indian symbols, because they express abstract ideas in simple line forms, and combines them for her symbol. The design thus made is full of significance for the girl, and appears in her beaded headband and ceremonial gown which she wears at council fires, and is used in her handcraft decoration. Her service garb is a plain white middie and dark skirt, but for ceremonial meetings and for official occasions she has a plain robe, embroidered in beads, decorated with block print designs or leather, in symbolic designs which she feels best express herself and her desires. This symbolism adds beauty to all of the ceremonies of Camp Fire groups and stimulates the imagination with which every girl is endowed to a wholesome appreciation of beauty and dignity. See GIRL SCOUTS. M.C.

CAMPBOR, *kam' fur*, a whitish, semi-transparent substance, with an aromatic taste and characteristic odor, obtained from the wood and

bark of a group of trees belonging to the laurel family. The camphor of commerce comes from a tree cultivated in Japan and China and on the island of Formosa. An attempt was made to establish the camphor industry in Florida, but it did not meet with much success because of the difficulty of competing with cheap Oriental labor. The United States imports about 3,000,000 pounds of camphor annually, over eighty per cent of which is used by manufacturers of celluloid and moving-picture films. The rest is utilized largely for medicinal purposes.



CAMPHOR

Camphor is extracted from branch cuttings of the camphor tree by steam distillation. The product is drained and pressed to separate it from oil and water, and the residue, a crystalline mass, is then purified. The most common liquid form of medicinal camphor, called *spirits of camphor*, is a mixture of ten parts camphor, seventy parts alcohol, and twenty parts water. Camphor has antiseptic properties, and is used in gargles and mouth washes. Since it tends to dispel gas in the alimentary canal, it is administered in cases of colic and other forms of dyspepsia. In collapse, fainting, and heart failure, camphor is used to stimulate circulatory and respiratory action, being administered hypodermically in olive- or almond-oil solution. It is also a counter-irritant, and is so used in liniments. Camphor is a poison in too large doses, causing delirium and convulsions.

Camphor gum is sometimes placed in furs and woolen garments to protect them from moths, but naphthalene, a cheaper substance, is more often employed for this purpose. Camphor has been made artificially from turpentine, but not economically enough to compete with the natural product.

Classification. The camphor laurel is known botanically as *Cinnamomum camphora*.

CAMPINE, *kam'peen'*. See BELGIUM (Physical Features).

CAMPO FORMIO, *kam'po fawr'mi o*, TREATY OF. See FRANCIS (Francis II, Holy Roman Emperor).

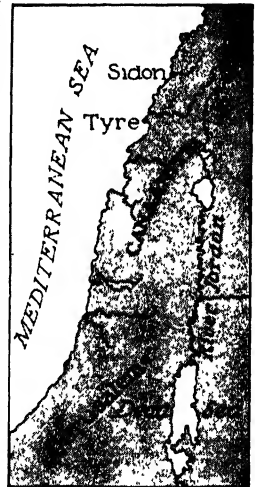
CAMP ROBBER, a local name for the jay (which see).

CAMPUS MARTIUS, *kam'pus mar'shus*, a large open space outside the walls of ancient Rome, set apart for military combats and athletic exercises, and sacred to the god Mars, for whom it was named. It lay between the Pincian, the Quirinal, and the Capitoline hills and the Tiber River, and in early times had an area of about 320 acres. Later, the field was made smaller by the erection of numerous private and public buildings, and toward the end of the republic, the Campus Martius became a suburban pleasure ground for the Romans, with gardens, shady walks, baths, and theaters. Agrippa erected there the old Pantheon, and Augustus built a magnificent tomb for himself. The site of the original Campus Martius is now occupied by a thickly settled portion of the modern business city. See map, in article ROME; also article on ROME (How the City Looked).

CANAAN, *ka'nan*, early name of Palestine (which see), the home of the Canaanites, described below.

CANAANITES, *ka'nan ites*, in general, the name given to the heathen nations dwelling in Palestine west of the Jordan before the conquest of the country by the Israelites. At the time of the Israelitish invasion, these nations were the Hittites, Jebusites, Hivites, and Amorites. According to the Old Testament, the Canaanites were descendants of Ham, second son of Noah; but as a matter of fact, only a part of the nations dwelling in Palestine at the time of the Israelitish invasion were Canaanites. The Canaanites were gradually subdued by the Israelites, and in Solomon's time they all paid tribute.

In language, government, morals, and religion these people were different from the Israelites, the principal feature of their religion being the worship of Baal and Asherah, his consort, who was called "the happy." The symbol of Asherah was the stem of a tree, though this was sometimes carved into an image. The symbol of Baal was probably a cone, and represented the rays of the sun. It was undoubtedly the mingling of these symbols in large numbers which constituted the groves of Baal, so frequently mentioned in the Old Testament. See, in these volumes, articles PALESTINE; BAAL; HITTITES.



LAND OF CANAAN



CANADA, DOMINION OF. Next to Great Britain, Canada is the most distinguished member of the British Commonwealth of Nations. A little more than a century and a half ago, in 1763, at the close of the French and Indian War, Great Britain formally acquired ownership of the French possessions in North America, then called New France. At that time, there were a few scattered settlements along the Saint Lawrence and its tributaries, but even Montreal and Quebec, the largest of these, were small villages. Canada in those days really comprised but a small part of the present province of Quebec. There were a few settlements in Nova Scotia and on Prince Edward Island, but with these exceptions, the rest of the great area now included in the Dominion was the home of Indians and wild beasts. The population of Canada was not more than 70,000.

For about fifteen years, this new British possession was practically a colony of Frenchmen, with a few British officials. During and after the Revolutionary War, however, a new element appeared, and by 1783 there were thousands of English-speaking settlers. They had left the rebellious English colonies, and had moved northward to establish new homes for themselves. These United Empire Loyalists formed the first important groups of English-speaking Canadians, and on the foundation-stones which they helped to lay has risen a great self-governing nation under the British flag.

Practically the whole of Canada's present population is descended from Europeans, and its present area is slightly larger than the whole of Europe. Excepting the southern part of Ontario, Quebec, and the Maritime Provinces, the country lies north of the forty-ninth parallel of latitude. In Europe, north of this parallel, are its richest and most populous nations. If Canada had centered under its one government all the peoples, the industries, and the resources of Europe north of this parallel, it would be one of the most populous and richest countries in the world. In Europe, north of the forty-ninth parallel, are the British Isles, Belgium, the Netherlands, Denmark, Norway, Sweden, nine-tenths of Germany, nearly all of Russia, nearly all of Poland, a part of Czechoslovakia, and all of France north of Paris. Near the sixtieth parallel are three great historic cities, Leningrad, Oslo, and Stockholm. Moved

directly westward, Leningrad would lie on the east shore of Hudson Bay, about as far north as the northern end of Labrador. Then Stockholm would be in the middle of Hudson Bay, and Oslo would be on the west shore, near Fort Churchill. London, Berlin, and Vienna would all fall within the Dominion from north to south.

In proportion to the population which Canada would have if Europe were transplanted upon it, its present population is but a tiny nation. The census of 1921 gave the Dominion a total of 8,788,483 inhabitants, half that of Rumania, one of the smaller European nations. Bulgaria has about 5,000,000 people, Hungary has 8,000,000, the Netherlands over 7,400,000.

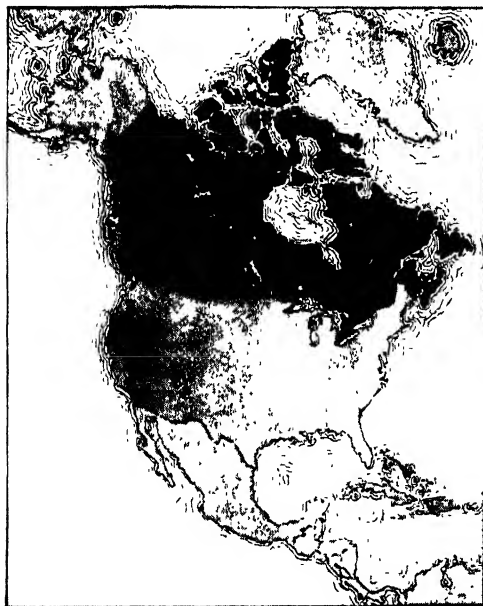
These comparisons can merely suggest the vast possibilities which lie within the Dominion. Its natural wealth has already given it a remarkable development, but its resources are still to a great extent undeveloped. What these resources are, how they have been and are being used, how the people who develop them live and govern themselves, how they have struggled in the past and are still struggling to make the history of Canada a noble one—all this is the story of Canada.

Area. The Dominion of Canada, with a total area of 3,684,723 square miles, occupies slightly less than one-half of the North American continent. With the exception of Alaska, Newfoundland, and Labrador, it includes all of North America north of the United States. The greatest length of the Dominion, from east to west, is about 2,700 miles; from north to south its greatest extent is 1,600 miles. Canada is the largest country in the world, Russia and China excepted (Australia being a continent). Its vast area is divided into provinces and territories as follows:

	SQUARE MILES
Alberta	255,285
British Columbia	355,855
Manitoba	251,832
New Brunswick	27,985
Nova Scotia	21,428
Ontario	407,262
Prince Edward Island	2,184
Quebec	594,434
Saskatchewan	251,700
Northwest Territories	1,309,682
Yukon	207,076
Total	3,684,723

This total does not include Hudson Bay,

which covers 443,750 square miles, and the Gulf of Saint Lawrence, which covers 101,562 square miles. It does, however, include those portions of the Great Lakes which lie within the Canadian boundaries, and all other water surface in the Dominion. This total area under water is 142,923 square miles. Except in the case of Quebec, the areas of the provinces as given in the table above were established in



THE DOMINION OF CANADA

Showing geographical position in North America.
Newfoundand and Labrador are also included

1912. By the boundary revision of that year the area of Manitoba was increased by 178,100 square miles, Ontario by 146,400 square miles, and Quebec by 354,961. The additions to Quebec, Ontario, and Manitoba were formerly part of the Northwest Territories. In 1927, however, Quebec lost 112,400 square miles to Labrador (which see) by a decision of the Privy Council of the Empire.

The People of Canada

Their Number. From a population of 70,000, scattered along the rivers, in 1760, Canada has grown to a nation which spreads from ocean to ocean and at the last census (1921) included 8,788,483 persons. It is an interesting fact that in the fifty years from 1871 to 1921 the population of Canada increased more in growth than in the whole preceding century. More than one-half of the increase since 1871 came in the decade from 1901 to 1911. In 1791 the total population was nearly 150,000, of which only about 25,000 were in Upper Canada (Ontario). In 1871, at the first census

of the Dominion, Ontario had nearly one-half of the total, or 3,689,257. During each decade until 1901 the population increased by about 500,000; but from 1901 to 1921 it jumped from 5,371,315 to 8,788,483; in 1929 the estimate of population was 9,660,000, an increase nearly four times the normal. The table below shows the distribution of the population by provinces and the density of population. For the growth of population in the provinces, see the article on each province, in these volumes.

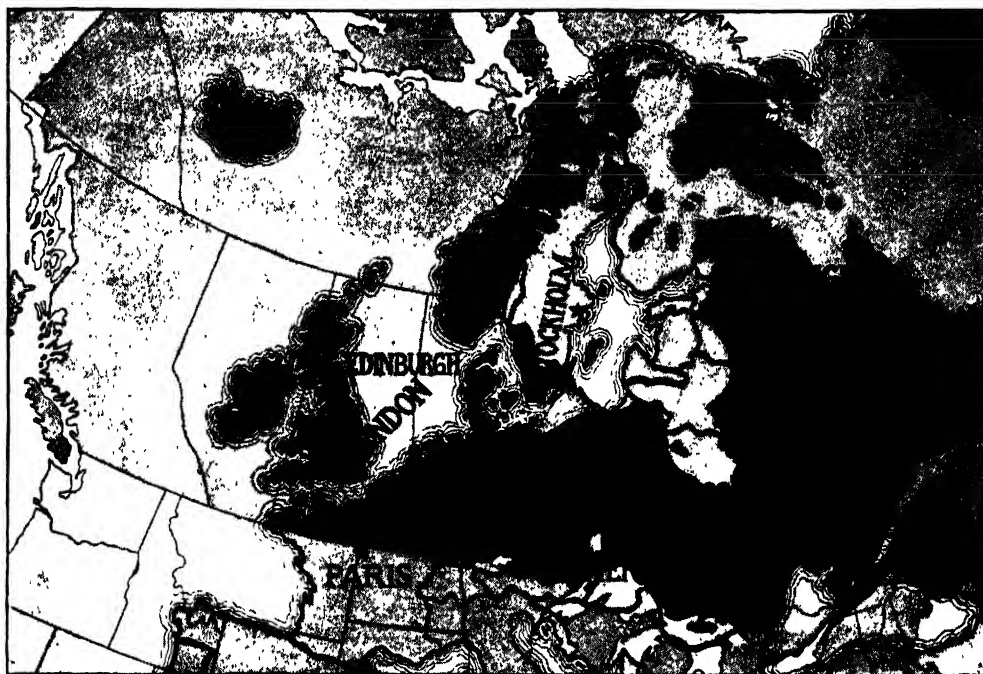
POPULATION OF THE DOMINION OF CANADA

PROVINCES	TOTAL, 1921 OR 1920	DENSITY OF POPULATION PER SQ. MI.
Alberta	*607,509	2.37
British Columbia	524,582	1.47
Manitoba	*639,056	2.53
New Brunswick	387,876	13.8
Nova Scotia	523,837	24.4
Ontario	2,933,662	8.02
Prince Edward Island	88,615	40.5
Quebec	2,361,190	3.42
Saskatchewan	*820,738	3.26
Yukon	4,157	0.02
Northwest Territories	7,988	0.005
Totals for Canada	8,788,483	2.00

* Census of 1926

Their Origins. The Dominion of Canada, like the United States, includes people from all parts of the civilized world. This varied stock has come more recently than in the case of the United States, and the process of absorption is comparatively slow. The French were the first settlers, and to this day, in the province of Quebec, there are hundreds of communities which are as French as they were 150 years ago. French is still the native tongue of nearly all Quebec. In Nova Scotia, the early settlers were mostly Scotch, whereas in New Brunswick, Ontario, and the eastern townships of Quebec, the first important settlements were made by United Empire Loyalists from New England. The Western provinces also have their share of Scotch, Irish, English, and French, as well as a larger proportion of other nationalities. The English number considerably more than 2,500,000; the French language is spoken (mostly in Quebec) by nearly 2,500,000; of Irish origin are over 1,000,000; of Scotch about 1,175,000. There are about 130,000 Jews, and 110,000 Indians. As many as twenty-five other nationalities are represented.

Their Religions. The Dominion has no State Church, although in Quebec the Roman Catholic Church has certain privileges which it has held since the days of French rule. The Roman Catholic Church was for a long time the only Church in Canada, and it still has the



CANADA AND EUROPE

A map of comparative locations in like latitudes. Stockholm, for illustration, is as far north as the center of Hudson Bay; Paris is just south of the latitude of the international boundary.

largest number of adherents, the Roman Catholics comprising about forty per cent of the population. They are strongest in Quebec and are of least relative importance in Alberta, Manitoba, and Ontario. In 1925 the Congrega-

tional, Methodist, and Presbyterian churches united, bringing nearly 700,000 members into the merger (see CANADA, UNITED CHURCH OF). The Anglicans are the next strongest Protestant organization.

Physical Characteristics of the Dominion

The physical features of Canada are comparatively simple and easily understood. More than one-half of the total surface slopes gently toward Hudson Bay. To the east and west are higher lands, rising in the west to some of the highest mountains in North America. The interior is not so much a valley as a great trough, irregular in shape, but considerably wider at the north than at the south. Although the whole of this interior might be expected to drain into Hudson Bay, two low elevations of land are sufficient to turn Canada's largest rivers, the Mackenzie and the Saint Lawrence, into smaller troughs of their own; the Mackenzie flows northwest to the Arctic Ocean, and the Saint Lawrence northeast to the Atlantic Ocean.

For purposes of study, then, the surface may be divided into these three regions: (1) the hilly eastern half, including the Laurentian plateau and the extension of the Appalachian system east of the Saint Lawrence Valley; (2) the interior plains, characterized by their

lack of trees; (3) the mountains, between the plains and the Pacific coast, including the Rocky Mountains and a number of smaller ranges. Each section is described below.

1. **Eastern Canada.** In this part is included all the territory from Hudson Bay to Labrador, as well as an area west of Hudson Bay (see LAURENTIAN PLATEAU). In this section the highest points, in Labrador, are about 8,000 feet above the level of the Atlantic Ocean. From Labrador westward, the altitude declines quickly, and the vast interior of Northern Quebec seldom exceeds 2,000 feet in altitude. The interior is a succession of low ridges of hard rocks, sometimes covered with a few trees, but as often bare. Between these ridges are lakes, swamps, and rapidly flowing rivers. With the exception of the Saint Lawrence, all the important rivers flow into Hudson Bay, which also receives several large rivers from the plains. The Hudson Bay basin is bounded at the south by a ridge, hardly noticeable; this is known as "the height of land."

South of this ridge the rivers are tributary to the Saint Lawrence, whose valley was the most important physical feature in determining the early course of Canadian history. Without the Saint Lawrence River, French Canada would probably have clung to the Atlantic shores; but with it the early explorers, trappers, traders, and missionaries found an easy way to the interior. It is not astonishing that the Saint Lawrence Valley, including the fertile plains of Southern Ontario, has always been the richest and most populous part of Canada. Though there are some deposits of petroleum, natural gas, and salt, the plains have no metals, and the wealth of this section is based on its fertile soil and temperate climate. The Saint Lawrence Valley is essentially a farming section, whereas the extensive areas of Northern Ontario and Quebec are mainly unsuited to cultivation.

As the Saint Lawrence approaches its mouth, the valley becomes narrower and is shut in by the rocky Gaspé Peninsula. This peninsula and the Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island comprise the Acadian region. Taken as a unit, this region is a continuation of the Appalachian highlands, which extend from Alabama northward parallel to the Atlantic coast of the United States.

The surface of this section was once almost completely covered with forests, and large tracts of timber still remain.

Besides the Saint Lawrence basin and the Acadian region, there is one other important feature of Eastern Canada's topography—the Niagara escarpment (meaning a steep slope). This is a line of cliffs forming a break in the Saint Lawrence basin, running from Queenston Heights west to the head of Lake Ontario, near Hamilton, then northwest until it forms the Bruce Peninsula, shutting off Georgian Bay from Lake Huron. The Niagara escarpment causes falls in the rivers which plunge over it, Niagara Falls (which see) being the greatest and most famous.

2. The Interior Plains. Between Eastern Canada and the mountains on the west is a vast region of plains, about 700 miles wide from east to west at the international boundary and gradually narrowing to 400 at the Arctic Ocean. These plains are a continuation of the great interior plains of the United States, and in a general way the two regions of plains are similar, but the Canadian plains are more broken and have more timber. The international boundary, latitude 49° N., nearly coincides with the watershed which divides the drainage into Hudson Bay from the great Mississippi system. From the international boundary the plains slope gradually northward and from the Rocky Mountains gradually eastward. The general slope, therefore, is from southwest to northeast.

Overlooking this flat prairie region is the first of two escarpments which raise the average altitude from 800 feet to 1,600 feet. This level, too, has many lakes, whose surplus waters are carried off by the Churchill, English, Dubawnt, and other rivers, northeast to Hudson Bay. The southern part of this level is drained by the Saskatchewan River, which rises at the foot of the Rocky Mountains and carries waters from all three levels into Lake Winnipeg and thus into Hudson Bay.

The second level rises gradually until it reaches the Missouri Coteau, sometimes called the *Grand Coteau des Prairies*, in Central Saskatchewan. This second escarpment represents a rise to an average level of 3,000 feet, slowly sloping upward to a maximum of 4,500 feet in Southwestern Alberta. Throughout the plains region there are few hills, and an elevation of a few hundred feet is so unusual that it is usually called a "mountain."

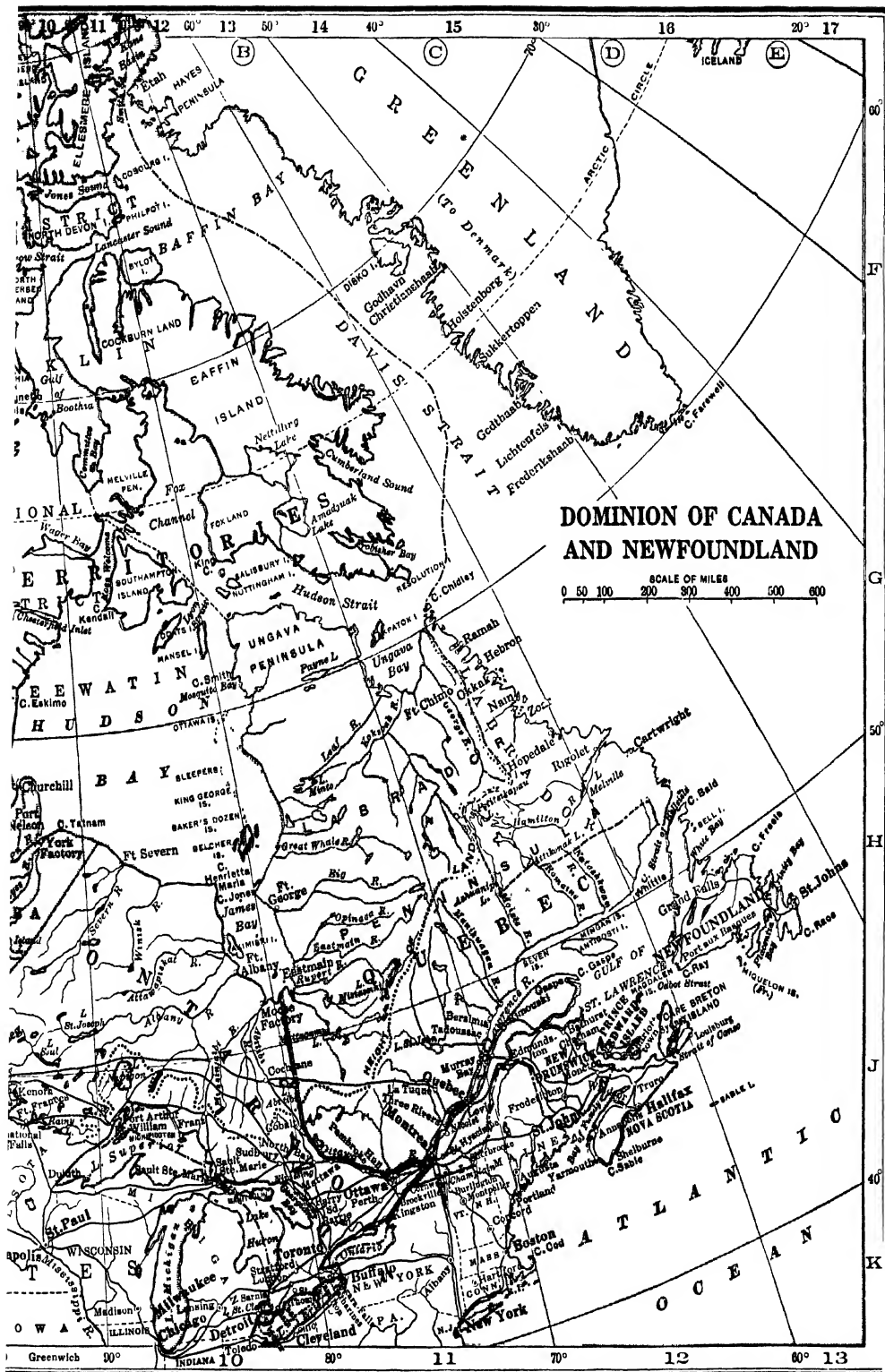
The southern part of the plains is treeless, except in the river beds; the course of the rivers can be followed by the narrow green band of trees on the banks. There are numerous lakes on the second and third levels, but in the southern part the climate is so dry that many of them are strongly alkaline, and some of them dry up entirely during the summer. The northern part of the plains, north of the North Saskatchewan River, is separated from the Saskatchewan drainage system by a line of highlands which acts as a watershed. This northern system includes the Athabaska and the Peace rivers, together with all the other great rivers and the lakes which are tributary to the Mackenzie, the greatest river system in Canada. The Saskatchewan and the Red rivers, though smaller than the Mackenzie, are economically more important. They were formerly the main avenues of travel, and their valleys are now the centers of population and wealth in the Canadian West.

3. The Mountains. The third of the great physical divisions is the mountain belt which extends over practically the whole of British Columbia, the Yukon, and the western part of Alberta. This does not mean that all of British Columbia and the Yukon is mountainous, for there are long stretches of flat or rolling country which separate the ranges. The entire region, however, is a part of the Cordilleran belt which extends along the western coast of both North and South America. While its physical characteristics are somewhat confused and complicated, its dominating features are the Rocky Mountains and the Coast Ranges. All the ranges run approximately northwest in parallel lines, there being only a few smaller cross ranges.

In these ranges there is an abundance of magnificent scenery. The eastern slopes are often gradual, but on the west the mountains

CANADA

ALBERTA	G 7	NEW BRUNSWICK	H 12	McClure Strait.	C 6	Perth, 3,790.	J 11
Athabaska, 435.	F 7	Bathurst, 3,327.	H 12	McPherson.	D 5	Port Arthur, 14,886.	H 10
Athabaska Lake.	F 7	Chatham, 4,506.	H 12	Melville Island.	B 7	Rainy Lake.	H 9
Athabaska River.	F 7	Edmundston, 4,035.	H 12	Melville Peninsula.	D 10	Saint Catharines, 19,881	J 11
Banff, 935.	G 7	Fredericton (capital).	H 12	Melville Sound.	C 8	Saint Clair, Lake.	J 10
Calgary, 65,513.	G 7	8,144.	H 12	Nettilling Lake.	D 11	Saint Joseph, Lake.	G 9
Chipewyan, 50.	F 7	Funby, Bay of.	J 12	Norman.	E 6	Saint Thomas, 16,026.	J 10
Dunvegan, 20.	F 7	Moncton, 17,488.	H 12	North Devon Island.	C 10	Sarnia, 14,877.	J 10
Edmonton (capital).	G 7	Saint John, 47,166.	J 12	North Somerset Island.	C 9	Sault, Sainte Marie,	
65,163.	G 7	Saint Lawrence, Gulf of.	H 12	Nottingham Island.	E 11	21,092.	H 10
Fort Vermilion.	F 7			Nuelin Lake.	E 9	Seul, Lake.	G 9
Grand Prairie, 1,061.	F 7	NORTHWEST	E 7	Ottawa Islands.	F 10	Severn.	F 10
Hay River.	F 7	TERRITORIES		Parry, Cape.	C 10	Severn River.	F 10
Lesser Slave Lake.	F 7	Akimiski Island.	G 10	Peel River.	D 5	Stratford, 16,094.	J 10
Lethbridge, 10,893.	H 7	Akpatok Island.	E 12	Peel Sound.	C 9	Sudbury, 8,621.	H 10
MacLeod, 1,715.	H 7	Amadjuak Lake.	E 12	Pelly, Lake.	E 8	Superior, Lake.	H 10
McKay.	F 7	Anderson River.	D 6	Philpot Island.	C 11	Toronto (capital).	
McMurray, 150.	F 7	Axel Heiberg Island.	B 9	Polynia Islands.	H 6	521,893.	J 11
Medicine Hat, 9,536.	H 7	Backs River.	E 9	Prince Albert Sound.	C 7	Windsor, 38,591.	J 10
Peace River.	F 7	Baffin Bay.	C 12	Prince of Wales Island.	C 9	Winisk River.	G 10
Peace River, 582.	F 7	Baffin Island.	D 11	Prince Patrick Island.	B 6	Woods, Lake of the.	H 9
Red Deer, 2,006.	G 7	Baker's Dozen Islands.	F 10	Providence.	E 7		
Yellowhead Pass.	G 7	Banks Island.	C 6	Resolution Island.	E 12	PRINCE EDWARD	H 12
		Barrow Strait.	C 9	Richards Island.	D 5	ISLAND	
		Bathurst, Cape.	C 6	Ringnes Islands.	B 8	Charlottetown (capital).	
		Bathurst Inlet.	D 8	Roes Welcome.	E 10	12,347.	H 12
		Bathurst Island.	B 8	Salsbury Island.	E 11		
		Belcher Island.	F 10	Simpson.	E 7	QUEBEC	G 12
		Boothia, Gulf of.	C 10	Slave River.	F 10	Anticosti Island, 451.	H 12
		Boothia Peninsula.	C 9	Sleepers (islands).	F 10	Ashtanipi Lake.	G 12
		Byam Martin Channel.	B 8	South Sound.	B 11	Bersimis, 69.	H 12
		Bylot Island.	C 11	Southampton Island.	E 10	Big River.	G 11
		Chesterfield Inlet.	E 9	Thelon River.	E 8	Eastmain.	G 11
		Clinton Colden Lake.	E 8	Victoria Island.	C 8	Eastmain River.	G 12
		Coats Island.	E 10	Victoria Strait.	D 9	Fort Chimo.	F 11
		Cobourg Island.	B 11	Wager Bay.	E 10	Fort George.	G 11
		Cookburn Land.	C 11	Wrigley.	E 9	Gaspe, 764.	H 12
		Committee Bay.	D 10	Yathkyed Lake.	E 9	Gaspe, Cape.	H 12
		Coppermine River.	D 7			George River.	F 12
		Coronation Gulf.	D 7			Great Whale River.	F 11
		Crown Prince Gustav		NOVA SCOTIA	J 12	Hull, 24,117.	H 11
		Sea.	B 9	Annapolis Royal, 836.	J 12	James Bay.	G 10
		Cumberland Sound.	E 12	Cabot Strait.	H 13	Jones, Cape.	G 10
		Davis Strait.	D 12	Canso, Strait of.	J 13	Koksoak River.	F 12
		Dease Strait.	D 8	Cape Breton Island,		Labrador Peninsula.	F 11
		Dolphin and Union		131,495.	H 13	La Tuque, 5,603.	H 11
		Strait.	D 7	Fundy, Bay of.	J 12	Leaf River.	F 11
		Dubawnt River.	E 8	Halifax (capital), 58,372	J 12	Levis, 10,470.	H 11
		Ellesmere Island.	B 10	Louisburg, 1,152.	J 13	Magdalen Islands, 7,127	H 12
		Eskimo, Cape.	E 9	Sable, Cape.	J 13	Manikuanagan River.	G 12
		Findlay Island.	B 8	Sable Island.	J 13	Mattagami Lake.	G 11
		Fort Liard.	E 6	Shelburne, 1,360.	J 13	Mingan Islands.	H 12
		Fort Rae.	E 7	Sydney, 22,545.	H 13	Minto, Lake.	F 11
		Fort Resolution.	E 7	Truro, 7,562.	J 12	Mistassini, Lake.	G 12
		Fort Smith.	E 7	Windsor, 3,591.	J 12	Moisie River.	G 12
		Fox Channel.	D 11	Yarmouth, 7,073.	J 12	Montreal, 618,506.	J 11
		Fox Land.	E 11			Mosquito Bay.	E 11
		Franklin Bay.	C 6			Murray Bay (place).	H 11
		Franklin, Provisional		ONTARIO	G 10	Natashkwan River.	G 12
		District of.	C 9	Abitibi Lake.	H 10	Nicolet, 2,342.	H 11
		Frobisher Bay.	E 12	Abitibi River.	H 10	Opinaka River.	G 11
		Garry Lake.	E 9	Albany River.	G 10	Ottawa River.	H 11
		Good Hope.	D 6	Attawapiskat River.	G 10	Payne Lake.	E 11
		Great Bear Lake.	E 6	Barrie, 6,936.	J 11	Quebec (capital), 95,193	H 11
		Great Slave Lake.	E 7	Brockville, 10,043.	J 11	Rimouski, 3,612.	H 12
		Hudson Bay.	E 10	Chatham, 13,256.	J 10	Romaine River.	G 12
		Hudson Strait.	E 11	Cobalt, 4,449.	H 10	Rupert River.	G 11
		Jones Sound.	B 10	Cochrane, 2,655.	H 10	Saint Hyacinthe, 10,859	J 11
		Kane Basin.	B 11	Cornwall, 7,419.	J 11	Saint John Lake.	H 11
		Kasba Lake.	E 8	Erie, Lake.	J 11	Saint Lawrence River.	H 12
		Kazan River.	E 8	Fort Albany (place).	G 10	Seven Islands, 510.	H 12
		Keewatin, Provisional		Fort Frances, 3,109.	H 9	Sherbrooke, 23,515.	I 11
		District of.	E 10	Fort William, 20,541.	H 10	Smith, Cape.	E 11
		Kendall, Cape.	D 7	Fort, 50.	H 10	Tadoussac, 470.	H 12
		Kendall Cape.	E 10	Georgian Bay.	J 10	Three Rivers, 22,367.	H 11
		King Cape.	E 11	Hamilton, 114,151.	J 11	Ungava Bay.	F 12
		King George Islands.	F 10	Henrietta Maria, Cape.	F 10	Ungava Peninsula.	E 11
		King William Island.	D 9	Huron, Lake.	J 10	Whittle, Cape.	G 13
		Krusenstern, Cape.	D 7	James Bay.	G 10		
		La Martre, Lac (lake).	E 6	Kenora, 5,407.	H 9	SASKATCHEWAN	G 8
		Lancaster Sound.	C 11	Kingston, 21,753.	J 11	Assiniboine River.	G 8
		Liard River.	F 6	London, 60,959.	J 10	Battleford, 1,018.	G 8
		Lind Island.	D 8	Mattawa, 1,462.	J 11	Buffalo Lake.	F 8
		Liverpool Bay.	C 6	Michipicoten Island.	H 10	Churchill River.	F 8
		Lyon Strait.	E 10	Missinai River.	G 10	Cree River.	F 8
		Mackay, Lake.	E 7	Moose Factory.	H 10	Montreal Lake.	F 8
		Mackenzie Bay.	D 5	Niagara Falls, 14,764.	J 11	Moose Jaw, 19,285.	G 8
		Mackenzie, Provisional		Nipigon, Lake.	H 10	North Portal, 211.	H 8
		District of.	E 7	Nipissing, Lake.	H 10	Prince Albert, 7,873.	G 8
		Mackenzie River.	D 5	North Bay, 10,692.	H 10	Ou'Appelle River.	G 8
		Magnetic Pole.	C 9	Ontario, Lake.	J 11	Regina (capital), 37,329	G 8
		Mansel Island.	E 10	Ottawa (capital), 93,740	J 11	Reindeer Lake.	F 8
		McClintock Channel.	C 8	Parry Sound, 3,546.	H 11	Saskatchewan River.	G 8
				Pembroke, 7,875.	H 11	Saskatoon, 31,234.	G 8
						Swift Current, 4,175.	G 8
BRITISH COLUMBIA	G 6						
Ascroft, 500.	G 6						
Bennett.	F 6						
Chilko Lake.	G 6						
Clinton, 150.	G 6						
Dixon Entrance (strait).	F 5						
Fernie, 4,343.	H 7						
Fort Fraser.	F 6						
Fort Graham.	F 6						
Fort McLeod.	F 6						
Fort Nelson (place).	F 6						
Fort Saint James (place).	F 6						
Fort Saint John, 20.	F 6						
Fraser River.	G 6						
Golden, 1,000.	G 7						
Graham Island.	G 5						
Hecate Strait.	G 5						
Juan de Fuca Strait.	H 6						
Kamloops, 4,501.	G 6						
Kootenay Lake.	G 7						
Moresby Island.	G 5						
Nanaimo, 8,877.	H 6						
Nootka Island.	H 6						
Nelson, 5,230.	H 7						
Onaganan Lake.	G 6						
Port Simpson (place).	F 5						
Prince George, 2,053.	G 6						
Prince Rupert, 6,393.	F 5						
Queen Charlotte Islands.	G 5						
Queen Charlotte Sound.	G 6						
Quesnel, 400.	G 6						
Revelstoke, 2,782.	G 6						
Rocky Mountains.	F 6						
Rossland, 2,097.	H 7						
Scott, Cape.	G 6						
Skeena River.	F 6						
Squamish.	H 6						
Steele.	H 7						
Stikine River.	F 5						
Union.	H 6						
Vancouver, 117,217.	H 6						
Vancouver Island.	G 6						
Victoria (capital).	H 6						
38,727.	H 6						
MANITOBA	G 9						
Assiniboine River.	G 8						
Brandon, 16,443.	G 8						
Churchill.	F 8						
Churchill River.	F 8						
Dauphin, 3,580.	G 8						
Emerson, 744.	H 9						
Gypsumville, 50.	G 9						
Hayes River.	F 9						
Island Lake.	G 9						
Manitoba, Lake.	G 9						
Nelson River.	F 9						
Portage la Prairie, 6,513	H 9						
Port Nelson (place).	F 9						
Seal River.	F 9						
Southern Indian Lake.	F 9						
Tatnam, Cape.	F 9						
The Pas, 1,925.	G 9						
Winnipeg (capital).	G 9						
191,998.	G 9						
Winnipeg, Lake.	G 9						
Winnipegosis, Lake.	G 9						
York Factory.	F 9						

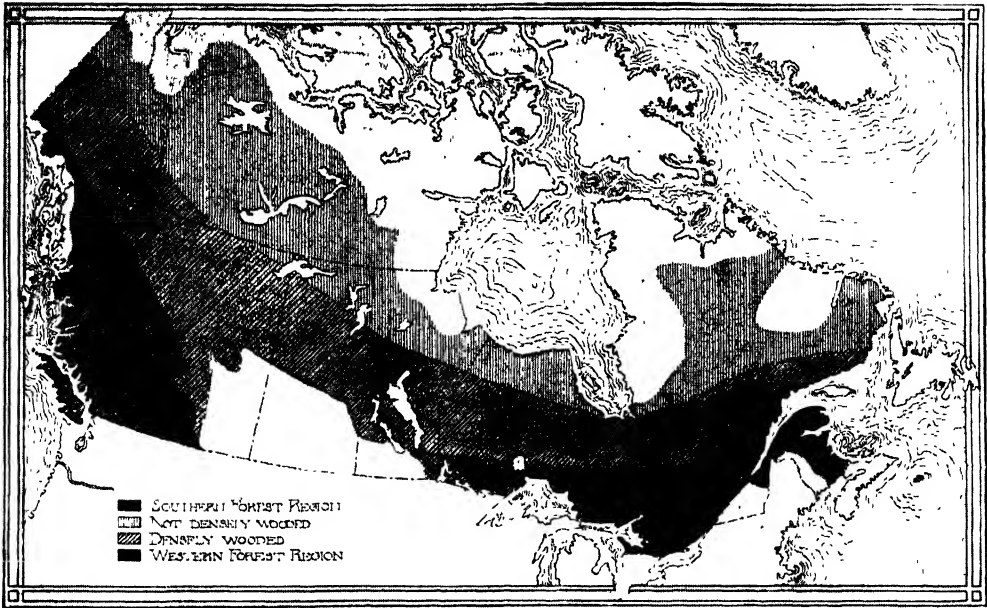


CANADA *Continued*

YUKON		E 5	Demarcation Point.... C 5	Lewes River... ..E 5	Stewart River.....E 5
Alsek River	E 5		Kluane Lake.....E 5	Peel River.....D 5	Teslin Lake.E 5
Dawson (capital), 975..	E 5		Laberge, Lake.....E 5	Selkirk.....E 5	Whitehorse, 331.....E 5

NEWFOUNDLAND

NEWFOUNDLAND		H 13	Placentia Bay. H 13	LABRADOR		F 12	Labrador Peninsula . . . F 11
Bald, Cape.....	G 13		Port aux Basques (place)H 13	Atikonak Lake.....	G 12		Melville, Lake. . . G 13
Belleisle, Strait of. . .	G 13		Race, Cape. J 13	Cartwright.....	G 13		Nain F 12
Bell Isle.....	G 13		Ray, Cape. H 13	Chidley, Cape	E 12		Okkak F 12
Cabot Strait.....	H 13		Saint Johns (capital),	Hamilton River... .	G 12		Petitsikapau Lake..... G 12
Freels, Cape	H 13		38,645 H 13	Hebron	F 12		Ramah F 12
Grand Falls 3,769 . . .	H 13		Trinity Bay H 13	Hopedale.....	F 12		Rigolet G 13
Miquelon Islands (<i>Fr.</i>)	J 13		White Bay.....G 13				Zoar.....F 12



FOREST AREAS OF CANADA

rise abruptly from green valleys to snow-covered peaks. The perpetual snow and ice on the summits of these peaks is due to their high latitude rather than their altitude, for only a few peaks rise over 10,000 or 11,000 feet. Among the loftiest of these are Robson, Alberta, Assiniboine, Columbia, Murchison, Fairweather, Vancouver, and Logan. Mount Logan, in the Yukon Territory, has an altitude of 19,850 feet, the highest point in Canada.

Climate. The climate of a country so vast in extent as Canada cannot be briefly summarized. Even in the limits of a single province there are frequently astonishing variations, due primarily to differences in latitude and altitude, but also to the presence of large bodies of water, sheltering mountain ranges and other local conditions. Canada extends from latitude 42° N. almost to the North Pole, a distance considerably more than one-fourth of the total distance from the North to the South Pole. Southern Ontario, the southernmost part of the Dominion, is in the latitude of Rome, Constantinople, and Peking. Between the extremes of polar cold and the mildness of the temperate zone are many steps which can only be indicated roughly. Taken as a whole, Canada has bracing weather, both summer and winter, with plenty of sunshine. The winters are severe and are accompanied by a heavy fall of snow. Spring is short, as is also summer, and the delightful autumn, with its Indian summer, is regarded by many as the best season of the year. For details of the climate in different localities, see the provinces.

On the Atlantic coast and in the Hudson Bay region, the climate is distinctly Arctic or sub-Arctic. The summers are short and warm, while the winters are long and very cold. The Labrador peninsula is not very inviting to settlers. The cold Labrador Current, laden with icebergs, which sweeps southward through Davis Strait past the shores of Greenland, keeps the entrance to Hudson Bay frozen for eight or nine months each year and carries icebergs and pack ice along the Labrador coast sometimes until midsummer.

South of the Gulf of Saint Lawrence are the Maritime Provinces, whose climate is affected by the warmer currents from the Gulf of Mexico. The Maritime Provinces, especially on the coasts, have frequent fogs and an excessive amount of rainfall, sometimes as high as fifty or fifty-five inches a year. The Saint Lawrence section has a bracing climate; the winters are cold and dry, with much snow and occasionally short periods of exceedingly cold weather. The winter air is invigorating, and the Saint Lawrence Valley is the scene of many outdoor winter sports, such as snow-shoeing, tobogganing, and skiing. The summers are warm and pleasant, without much humidity, but at the necessary time there is usually an abundance of rain for the crops. Northern Ontario, like the Labrador peninsula, has severe winters, with much more snow than the southern part. Even in winter, however, there is a great deal of sunshine, and the cool, clear summers have made the region a favorite resort.

The climate of the western half of the Dominion, including the mountain and prairie sections, shows even greater variety of climate than the eastern half. The prevailing winds are from the west, and reach the coast after a passage over the warm Pacific Ocean, whose waters are 20° warmer than those of the Atlantic. When these westerly winds strike the cold Coast Range, they lose much of their warmth and moisture. Along the coast there is, consequently, a warm, rainy climate. Flowers bloom the year around, and fruits and vegetables almost reach perfection.

By the time the winds cross the Rocky Mountains, they have lost nearly all of their strength. A local wind, called the *chinook* (which see), has marked influence on the climate, cooling the air in summer and warming it in winter. A noteworthy result of the chinook wind is the open character of the winters; the snow is quickly melted and evaporated by the warm, dry winds. The prairie provinces as a whole have a distinctly continental climate, with short, warm summers and very cold, dry winters. Both in summer and in winter, there is abundant sunshine. The growing season for crops is short, but as the sun is above the horizon for nearly twenty hours out of the twenty-four, nearly all staple grains and vegetables mature far north in the Peace River Valley, and even beyond. There is always in these extreme northern regions, however, the fear that frost will come before the crops are matured.

Plant and Animal Life

Native vegetation in Canada is less varied than might be expected from the great extent of the country and the wide differences in climate. The entire northern and northeastern part of the Dominion has an Arctic or sub-Arctic type of plant life. The vegetation is sparse, and includes only mosses, lichens, and a few hardy herbs and willows. South of this region appears an entirely different type of vegetation. The Saint Lawrence Valley and the Maritime Provinces were once covered with great forests, including both hard and soft woods. Large areas have been cleared or burned, and others have been deforested from natural causes. There are still large areas of standing timber which constitute one of the great resources of Eastern Canada. The most important species are white spruce, white pine, balsam fir, and hemlock, among the cone-bearing trees; and birch, maple, basswood, elm, oak, and ash, among the hard woods.

The prairies of Manitoba, Saskatchewan, and Alberta are almost treeless. Manitoba has small areas of spruce, fir, cedar, poplar, paper birch, ash, and other trees, but they are of little importance except locally. In Southern

Saskatchewan and Alberta the only native trees are poplar, willow, and cottonwood, and even these are confined to the banks of the rivers. North of the Saskatchewan River, the vegetation becomes more plentiful, and from Hudson Bay to the Rocky Mountains is a broad belt of spruce, tamarack, and poplar. The trees are not as large as those of the Eastern sections, nor are they as important commercially.

The greatest forests remaining in Canada are in the Pacific, or mountain, belt. There are thousands of square miles of virgin timber, giant trees, many of them 200 to 300 feet high. Spruce, hemlock, and cedar are most common in these regions.

The Animals of Canada. The animal life of Canada, like the plant life, may be divided into several belts, or regions. Roughly considered, these belts are *circumpolar*; that is, the animals found there are of the same species as those found in Europe and Asia at the same distance from the North Pole. There are no animals which are distinctively Canadian and not found elsewhere. The beaver, to be sure, is so common and so characteristic that it has become the national emblem, but the beaver is also found in other countries, though in ever-decreasing numbers.

Of the larger animals, there is still a great variety in the unsettled regions. The musk ox and the caribou are common in the Hudson Bay region and farther south in winter, and the woodland caribou is found in all the provinces except Prince Edward Island. The stately moose ranges the forests; no more of the bison, or American buffalo, roam over the plains, once the home of countless thousands of these characteristically American animals; they are found now only on reservations. The Virginian deer and the black-tailed deer are still plentiful in all Southern Canada, but the wapiti, or American elk, which once wandered in great bands from Quebec to the Pacific and from the Peace River far southward into the United States, has been almost exterminated.

The black bear is common in nearly all parts of Canada, except along the Arctic shores, where the polar bear has his haunts. In the Rockies and the other mountains in the West, there are many grizzly and brown bears. More characteristic of the mountains perhaps are the bighorn, or Rocky Mountain sheep, and the Rocky Mountain goat, whose agility and sure-footedness, even on the sharpest peaks and the most precipitous slopes, protect them from wholesale slaughter. Among the other large animals still to be found in various parts of the Dominion are the timber wolf, the coyote, the puma (or cougar), and the red fox. Silver fox, lynx, beaver, otter, marten, fisher, mink, and skunk are the most important and numerous of the fur-bearing animals. All the fur-bearing and game animals are now protected

SOME ANIMALS *of* CANADA



Polar Bear



Otter



Caribou



Virginian Deer



Grizzly Bear



Beaver



Fox



Musk-ox



Lynx



Moose

by law from hunters during stated seasons, but their number, nevertheless, seems to be steadily decreasing, and the fur trade is becoming of less importance.

Birds. Although Canada has a few birds which are unknown in regions to the south, most of Canada's birds are migratory and are well known in all temperate climates. Canada is their breeding-ground, but when the cold weather approaches, they flock to the warmer southland sections [see **BIRDS** (Migration of Birds)]. The game birds, or wild fowl, are particularly numerous in the West, where their breeding grounds extend from Southern Manitoba and the Western prairies even to the

Arctic Ocean. Besides many ducks and geese, there are gulls, cormorants, albatrosses, fulmars, petrels, and other sea birds. Golden eagles, bald-headed eagles, owls, hawks, ravens, and crows are common. In parts of Ontario the wild turkey and quail are occasionally seen, and in British Columbia the California quail and the mountain partridge are found. There are many varieties of grouse, including the prairie chicken and the so-called partridge. The Canada jay, the waxwing, grosbeak, snow bunting, and sometimes the raven, remain in Canada throughout the winter. Songbirds are found everywhere, especially in regions which are still well wooded.

Canada's Natural Resources

The Dominion of Canada is essentially an agricultural country, and is not "Our Lady of the Snows," an appellation in an early day and very properly resented by loyal Canadians. Its greatest natural resource is the great belt of fertile land which extends with scarcely a break from the Atlantic to the Pacific. This belt is the southern part of the Dominion, including the rich river valleys of British Columbia, the fertile plains of the prairie provinces and the productive valley of the Saint Lawrence. With the exception of the barren strip around Lake Superior, this belt is the best-developed section of Canada.

North of this fertile belt is a strip of prairie extending almost entirely across the continent. Less fertile and less suited to cultivation than the southern belt, it is yet an important area, which is now receiving great agricultural development. The raising of cattle and sheep is comparatively a minor pursuit, but it can easily be developed in this region and in the higher areas near the foothills of the Rocky Mountains. The northern part of Canada is unsuited to agricultural development, but it has great mineral deposits whose extent is scarcely appreciated. Gold, silver, copper, iron, lead, and coal are found in large areas, even as far south as the United States boundary. The coal and iron deposits of the Maritime Provinces are among the greatest in North America.

The forests constitute another great resource. It has been estimated that the forest area of Canada is about 500,000,000 acres, from fifty to sixty per cent of which is covered with timber of merchantable size. The lumbering industry is important in all the provinces except Prince Edward Island and the prairie provinces, but even in the latter, attempts are constantly being made to utilize the timber now available and provide for an increase in the future supply.

It has been said that the Canadian fisheries are the greatest in the world. This statement is no exaggeration, if account is taken of the possible extent of the fishing industry rather

than its present development. On both the Atlantic and Pacific coasts the fisheries, with proper regulation, are capable of almost indefinite expansion, and the inland fresh-water fisheries are also only beginning to yield their wealth. In connection with the forests and fisheries the subject of conservation is a leading issue. The mineral wealth of a country cannot be increased by man, but the forests and fisheries can be replenished and even increased by care.

Canada is fortunate in that it has all the natural resources—including vast water power to help in their development—on which the economic prosperity of a nation depends. The extent to which these resources have been utilized is told below in detail.

Agriculture

Agriculture is necessarily one of the first pursuits in which men engage, and fully one-half of the total population of the Dominion are directly engaged in, or dependent for their living on, the cultivation of the soil. Thousands of people, too, are employed in the trade and transportation of food products, in milling, in meat packing, and in other industries which arise as a result of agriculture. The first settlers made their little clearings in the Saint Lawrence Valley and in the Maritime Provinces, and a little farming was done in British Columbia even before its admission to the Dominion.

To-day agricultural interests represent a capital investment for the Dominion of over five billion dollars. Of this total one-fourth is in Ontario, about one-fifth in Saskatchewan, and one-tenth each in Alberta and Manitoba. Practically 360,000,000 acres of the Dominion are available for agriculture. This latter area is more than two and one-half times the present occupied area and five times the present improved area of farm lands. Hence, there is opportunity for vast agricultural expansion.



ALEXANDRA FALLS

Photo. Topographical Survey of Canada

Close view of brink of falls from west bank. The location is on Hay River, not far above the northern boundary of Alberta, and about forty-five miles from Great Slave Lake. The height of the falls is 100 feet. A mile below the Alexandra Falls is a second and smaller cataract, Louise Falls. Both are in surroundings of wild beauty.

At first, the plains of Alberta, Saskatchewan, and Manitoba were regarded as useful only for grazing; but once the immense possibilities of this region were realized, it became one of the greatest grain-growing areas in the world. The development of the West has come almost entirely since the beginning of the twentieth century. For many years Ontario was the largest producer of wheat and oats, but Saskatchewan, after 1911, took leading place in their production. Grain may be raised successfully far beyond the present northern limits of grain-growing areas. Good wheat has been raised as far north as Fort Vermilion, on the Peace River, about 800 miles north of the United States boundary, and at Fort Simpson, on the Mackenzie River, 1,000 miles north of that boundary. The danger from frost, however, is present in many sections during late summer.

Tables giving annual production are subject to great fluctuation, but we may profitably summarize. In the period of high prices following the World War, the crops of the Dominion were worth over \$1,500,000,000 (1919); the deflation period reduced their value to \$900,000,000 in 1923. Thereafter they steadily rose, and now average from \$1,300,000,000 to \$1,550,000,000 per year.

Agriculture has naturally reached its highest development in the Dominion in the sections which have been cultivated the longest; these are Prince Edward Island, a few sheltered valleys in Nova Scotia and New Brunswick, the valley of the Saint Lawrence above Quebec,

and the southern peninsula of Ontario. It is true, however, that these sections are better known for the production of a few crops than for the value of their total output. Potatoes and turnips receive special attention in the Maritime Provinces. Apples are cultivated extensively in the Annapolis Valley in Nova Scotia and the Saint John Valley in New Brunswick. Ontario produces about 70 per cent of the apple crop of the Dominion. Southern Ontario, especially the Niagara peninsula, is famous for its peaches, grapes, and small fruits. Berries, in fact, flourish anywhere in Southern Canada, even on the Western prairies. British Columbia has a smaller area suited to cultivation, but its variety of soil and climate adapts it for the growing of many fruits and vegetables which do not flourish elsewhere.

In the older sections, and even on the more recently settled prairies, there is an increasing tendency toward diversification of crops and the raising of cattle and other livestock. For some years, at least, there were many farms on which wheat was the only crop; if the wheat crop was even a partial failure, there was serious hardship for the farmer. Nowadays many farmers have cattle, horses, and swine, and perhaps a few sheep.

Wheat Pools. Important developments have occurred in Western Canada within the past few years by the organization of what are known as "wheat pools," a form of coöperative marketing. The inspiration of these enterprises was apparently supplied by the government during



Photo. U & U

SMALLEST INTERNATIONAL BRIDGE IN THE WORLD

It connects two small islands in the Saint Lawrence River. The land at the left is territory of the United States; at the right, the island belongs to Canada

the World War in its control of grain-marketing. The method of the "pool" is to secure five-year contracts with wheat-growers for disposal of all wheat grown by them, except what is required for food and for seed. A definite price is fixed, according to the grade of wheat, and it is paid in installments. Expenses are deducted from the final installment. It has been found that better prices are realized for members than by the ordinary system of marketing.

[In the article COOPERATION, in these volumes, there is further development of this general topic, and to it the reader is referred.]

Livestock. Horses, cattle, and other livestock are raised in large numbers. Heavy draught horses were formerly raised, chiefly in Ontario, but now to an increasing extent in the Western provinces. Thoroughbreds, including carriage and saddle horses, are bred in many sections. Large numbers of horses of all kinds were sent to Europe early in the World War for use by the allied armies. The raising of livestock is noticeably decreasing in the Eastern provinces, but is increasing rapidly in the West. Great progress has been made in improvement of breeding stock.

Since Confederation (1871) the number of horses in Canada has increased fourfold, and now total nearly 3,600,000; cattle have had about the same increase, and number more than 9,200,000; in 1871 the Dominion possessed 3,155,500 sheep, and to-day the number is practically the same. The number of hogs in the Dominion exceeds 4,500,000; the milch cows total 4,000,000.

No branch of agriculture has developed more rapidly than dairying and its allied industry, poultry-raising. The annual production of

butter, cheese, and milk sold is worth over \$240,000,000.

Irrigation. The development of Western Canada, while due in the first instance to the construction of transcontinental railways, has been greatly stimulated by irrigation. This is especially true in British Columbia, and to an increasing extent in Alberta and Saskatchewan. Irrigation on a small scale was practiced on the prairies when these districts were first settled, but the irrigated areas were small, and the works were crude. There was at that time no law regulating the use of water for irrigation, and every farmer and rancher took as much as he needed or wanted. The confusion which resulted was untangled by a Dominion law of 1804 and its amendments. This law applied only to the Northwest, but in British Columbia and the Eastern provinces, irrigation was already under provincial control. The development of irrigation has been marked, especially since 1910. The best known and the largest of all the irrigation projects is that of the Canadian Pacific Railway, in the region between Calgary and Medicine Hat. The vicinities of Lethbridge and Moose Jaw are also irrigation centers. In British Columbia, irrigation is most extensive in the south, in the Okanagan, Thompson, and Columbia valleys. For further details, see each province, in these volumes.

How the Government Helps the Farmer. The Dominion government, through the Department of Agriculture, helps the farmer, the rancher, and everybody whose living is derived from the soil, in many ways. In 1887 the Department established the central experimental farm at Ottawa. Since then numerous branch experimental farms have been established; the following table gives the facts relating to each:

FARM OR STATION	PROVINCE	ACREAGE	DATE ESTABLISHED
Central Farm, Ottawa	Ontario	467	1886
Kapuskasing Station	Ontario	1,282	1916
Harrow Tobacco Station	Ontario	49	1909
Charlottetown Station	Prince Edward Island	151	1909
Nappan Farm	Nova Scotia	460	1886
Kentville Station	Nova Scotia	434	1912
Fredericton Station	New Brunswick	520	1912
Ste. Anne de la Pocatiere Station	Quebec	340	1911
Cap Rouge Station	Quebec	339	1911
Lennoxville Station	Quebec	455	1914
La Ferme Station	Quebec	1,200	1916
Farnham Tobacco Station	Quebec	65	1912
Brandon Farm	Manitoba	625	1886
Morden Station	Manitoba	280	1915
Indian Head Farm	Saskatchewan	680	1886
Rosthern Station	Saskatchewan	650	1908
Scott Station	Saskatchewan	520	1910
Swift Current Station	Saskatchewan	640	1920
Lacombe Station	Alberta	850	1907
Lethbridge Station	Alberta	400	1906
Invermere Station	British Columbia	53	1912
Summerland Station	British Columbia	550	1914
Agassiz Farm	British Columbia	1,400	1886
Sidney Station, Vancouver Island	British Columbia	125	1912

In addition to the above, there are sub-stations at the following points, Swede Creek, Yukon Territory; Salmon Arm, British Columbia; Fort Vermilion and Beaverlodge, Alberta, Forts Smith, Resolution, and Providence, Northwest Territories; and Betsiamites, Saguenay County, Quebec

At any of these stations information may be secured as to the best methods of preparing the soil, the most profitable crops to raise, and any other facts the farmer wishes to know, so far as science has developed them.

The health-of-animals branch of the Department of Agriculture not only enforces the laws relating to quarantine and inspection, but is constantly carrying on valuable experiments relating to animal diseases. Through the efforts of this branch, Canada is now free from rinderpest, pleuro-pneumonia, and the foot-and-mouth disease. The government has also provided a national registration system for pedigreed livestock, and the effect on the cattle has been noteworthy.

The activities of the government in relation to agriculture are almost numberless. It furnishes information as to the operation of dairying factories and maintains model creameries and cheese factories. Inspectors give information about the best ways to pack fruit, butter, and cheese. The government also offers bounties, or subsidies, under certain conditions, to persons who provide cold-storage facilities. One of its most important services is in the extension of markets. Commercial agents are stationed at various foreign cities throughout the world to study foreign markets and the best methods of introducing Canadian products or furthering their sale.

Fisheries of Canada

The waters in and about Canada contain the principal food fishes in greater abundance than do the waters in almost any other part of the world. It is true, however, that the total value of the annual catch in the United States is far in excess of that in Canada, but a large part of this excess is due to the fact that fish caught off Canadian coasts and landed in United States ports are credited to the United States. The Canadian fisheries are naturally divided into three groups—the Atlantic, the Pacific, and the inland fisheries.

Atlantic Fisheries. The Atlantic fisheries may be divided into two classes, the *deep-sea* fisheries and the *inshore*, or *coastal*, fisheries. The deep-sea fishing grounds are off the "banks," twenty to ninety miles from the coast of Newfoundland, and the fishing is usually carried on from trawlers of forty to 100 tons. Trawling with hook and line, with herring and squid as bait, is the customary method. Cod, haddock, hake, and halibut are the principal varieties caught. In the inshore, or coastal, fisheries smaller boats are used, with crews of two or three men, using nets, hand lines, and trawls. The inshore fisheries extend along the coast line of Quebec and the Maritime Provinces, a total length of more than 5,000 miles. On this coast are many caves and natural

harbors, in most of which fish can be taken with little effort. In addition to the fishes already mentioned, the principal varieties caught inshore are herring, mackerel, shad, smelt, flounder, and sardine. Lobsters are taken in large numbers, and excellent oyster beds exist in many parts of the Gulf of Saint Lawrence.

Pacific Fisheries. The fisheries on the Pacific coast are obviously in British Columbia. For many years they were of little value, then they rose slowly to second place, and finally to an undisputed leadership. The irregular coast of British Columbia, with thousands of inlets, bays, and islands, makes a shore line over 7,000 miles long, which probably is better stocked with fish than any other part of the world. Herring exist in abundance, but the most important catch is salmon (which see).

Inland or Fresh-Water Fisheries. It has been estimated that the Dominion has about 220,000 square miles of fresh-water area, practically the whole of which is well stocked with fish. The Canadian part of the Great Lakes is only one-fifth of the area of Canada's fresh-water lakes. The most important fresh-water fishes are whitefish, trout, pickerel, pike, and sturgeon.

The fresh-water fisheries also include many spots in which game fish abound. Canada, in fact, is the fisherman's paradise, for every part of the Dominion except Southern Alberta and Saskatchewan offers him unending opportunity.

Value of the Fisheries. The market value of all kinds of fish and fish products taken by Canadian fishermen averages close to \$50,000,000 a year. Salmon always heads the list in value, being about one-third of the total. Next in order come codfish (about \$6,000,000), halibut, herring, whitefish, haddock, and sardines.

Mining

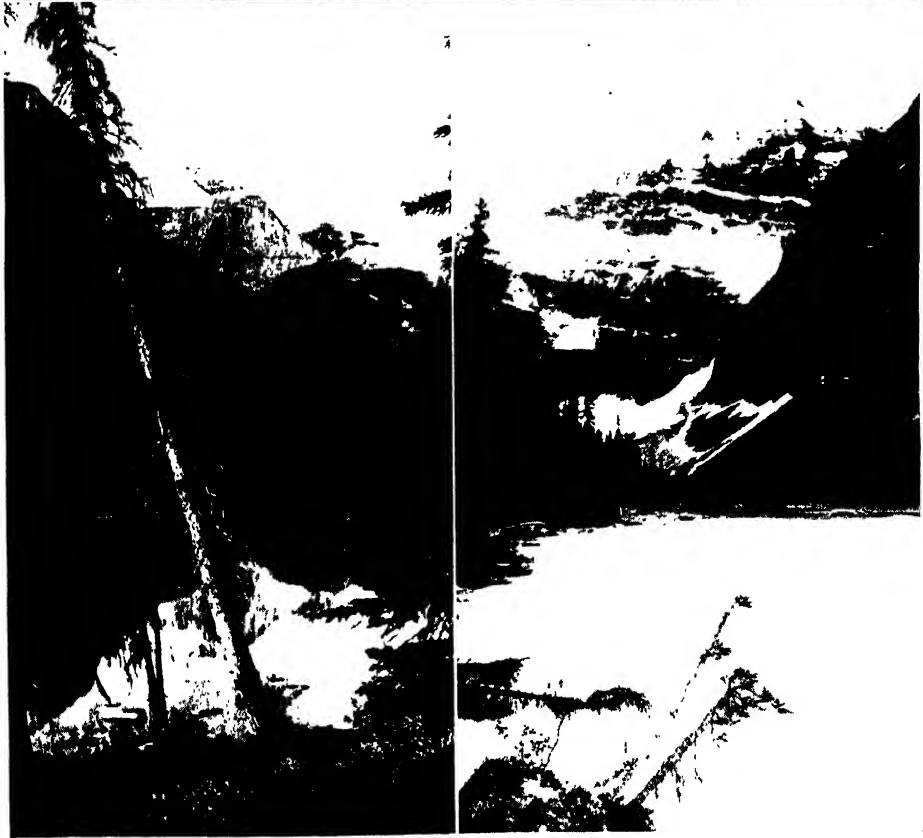
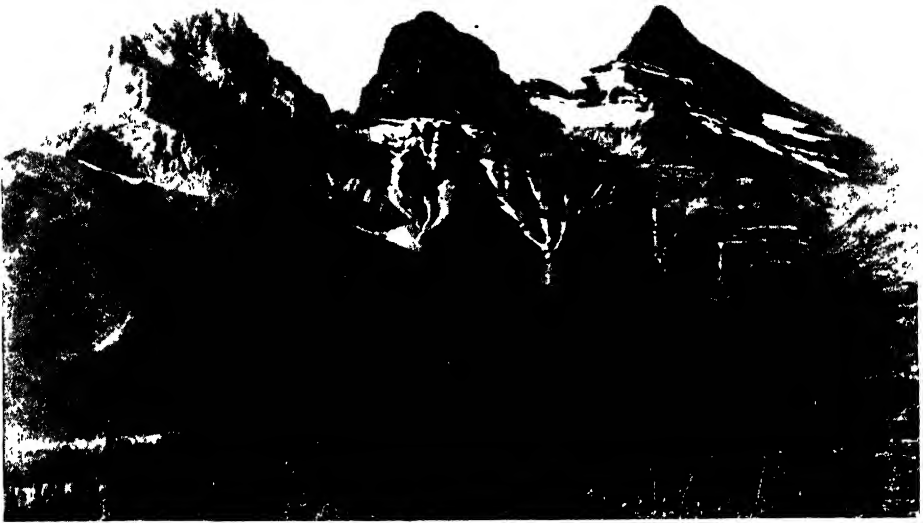
It has long been known that Canada is rich in mineral deposits, but only in recent years has the approximate extent of this resource been determined. To-day mining is third among Canada's primary industries. As explained above (see *Physical Characteristics*), the Eastern and Western sections of the Dominion are geologically a continuation of the mountain systems of the United States, and it is now known that the minerals found in the Appalachian chain and the Rocky Mountains and Coast Range exist in the corresponding parts of Canada. There is a third mineral-bearing area, the Lake Superior region, almost midway between the Atlantic and Pacific coasts. While the existence of these mineral deposits was known for years, peculiar conditions prevented development. In the first place, without transportation facilities it was impossible to mine profitably. Then the

mining regions had a sparse population, and, except in Nova Scotia, extended over a large area. The severity of the climate doubtless discouraged some prospectors, but the chief difficulty was that the great coal supplies, necessary for smelting, were in Nova Scotia, while the richest ore deposits lay 2,000 miles or more away.

Coal. This is by far the most valuable mineral product at present, although gold held this honor at one time. Nova Scotia for many years produced an average of 6,000,000 to 7,000,000 tons a year, approximately half of the total for the Dominion. British Columbia, with an average output of 2,000,000 to 3,000,000 tons, and Alberta, with an output which has several times touched 4,000,000 tons, are the only other important producers. Formerly Nova Scotia, as stated above, produced more coal than all the remainder of the Dominion. To-day Alberta outranks all the others in producing this necessity. Most of the coal is bituminous, or soft coal, of fairly good quality, but small pockets of anthracite have been opened near Calgary and on Queen Charlotte Island. Anthracite has also been found in Northern Ontario, along the Albany River. Small deposits of bituminous coal exist in New Brunswick, but in the other provinces only lignite of various grades is found. The total coal production of the Dominion is worth about \$60,000,000 a year.

Gold. The gold production of Canada reached its highest point in 1900 and 1901, when the placer mines (see GOLD) of the Klondike were being worked to their fullest capacity. Gold has been mined in small quantities in Nova Scotia almost from the days of the pioneer settlers, and small deposits are known in Quebec. Placer mining in British Columbia was also an early industry, but the gold output had never reached a total value of more than \$1,500,000 until 1805. In that year it was just over \$2,000,000; in 1897, the year of the great Klondike strike, it was over \$6,000,000; and by 1900 it reached \$27,000,000. During the Klondike excitement, the introduction of lode and hydraulic mining in British Columbia increased the output of that province from an average of less than \$500,000 to one of \$5,000,000. After 1900 the output of the Dominion slowly declined until the opening of the Porcupine district in Ontario in 1911, when it rose from an average of \$9,000,000 to a new level of over \$36,000,000, within fifteen years. In 1926 a new field was opened in Northwestern Ontario, at Red Lake.

Silver and Lead. During the nineteenth century silver was mined in small quantities in Ontario and Quebec and to a trifling extent in British Columbia. The deposits were not known to be large or valuable, and little was done to develop them until the end of the



In the Canadian Rockies. The imposing peaks known as the Three Sisters. Below, at left, is beautiful Lake Louise, and at the right, Mount Edith Cavell.

century. British Columbia's output increased from 77,000 ounces in 1892 to 5,472,000 ounces in 1897, and now averages over 7,000,000 ounces. Most of Canada's silver production is in Ontario, where the metal was discovered in the Cobalt district in 1904 and 1905. That district alone now yields over 95 per cent of the output of the Dominion. In nearly all parts of the Dominion where silver is mined, it is found in combination with lead. Silver has reached a value of \$14,000,000 a year; lead, almost \$20,000,000.

Other Minerals. Canada is the world's greatest producer of nickel and asbestos. Its only rival in the production of nickel is New Caledonia, an island near Australia, which is now in second place, and in asbestos it has no rival. Nickel is mined in Ontario, in the Sudbury district, northeast of Lake Huron; the asbestos comes from the eastern part of Quebec, Thetford being the center of the industry. Iron is found in every province, but its production has been unimportant until recent years. Upon the outbreak of the World War, the production of Canadian iron increased enormously, due to war demands. Large amounts of copper are extracted each year in Ontario and British Columbia, and smaller quantities in Quebec. The great war gave such an impetus to mineral development that its effects in this direction were destined to be permanently beneficial.

Canadian Leadership. While the percentages may change slightly from year to year, the following statements are approximately correct: The Dominion produces 90 per cent of the world's supply of nickel, 85 per cent of the world's asbestos, 55 per cent of the world's cobalt, 9 per cent of the world's gold, more than 8 per cent of the world's silver, and about 4 per cent of the world's copper. It is foremost in the production of nickel, cobalt, and asbestos; is third in the output of gold and lead; fourth among silver-producing countries; and the sixth largest producer of aluminum, with every prospect of improving this position.

Manufactures

Canada has great natural resources and abundant power to develop them, but the expansion of the manufacturing industries has become a feature only in recent years. As late as 1900 the value of manufactures was \$480,000,000 per year; in three decades they have increased to over \$3,000,000,000 in annual value.

Manufacturing has naturally developed most in those sections which have offered the best opportunities. In Nova Scotia coal is plentiful, and in Ontario, Quebec, and to a less degree in New Brunswick, there is abundant water power. Large sections of these provinces are

manufacturing communities. In Ontario, the electric power derived from Niagara Falls is distributed to towns at a distance. The forests supply raw material for all kinds of wood products. An abundant supply of hemlock has made these provinces the leaders in the leather industry. Cotton goods are made chiefly in Quebec, and woollens in Ontario. In British Columbia, the manufacture of lumber products, the smelting of ore, and the packing and preserving of fish are most important and have raised the province to third place in manufactures.

In the prairie provinces, however, manufacturers have had little inducement, and the manufacturing industries are comparatively few, the most important ones being dependent on agriculture for raw materials. At Winnipeg, Edmonton, Calgary, and other cities, meat packing is a growing industry; the making of flour- and grist-mill products, bread and other bakery goods, and car-repairing, are the other important industries.

In the number of people employed in any one industry, saw-milling leads Canada's list of manufacturing enterprises. Engaged in the various processes from tree-felling to the stacking of finished lumber, over 35,000 people are employed, but in the total value of the annual product (about \$140,000,000), lumbering and saw-milling ranks fourth among the Dominion's industries, and third in respect to capital employed (\$3,808,000,000).

The greatest aggregation of capital is concerned with the production of electric light and power. Nearly \$750,000,000 is invested in such enterprises, but the product is about seventh in value, averaging as yet less than \$110,000,000, but with prospects of vast expansion. Fewer than 15,000 people are engaged in this industry.

Second in number of people employed is the business of paper and pulp manufacture; it is also second in the amount of capital invested, but is first in value of products. Nearly 30,000 people find employment in the various phases of paper-making; the capital involved is close to \$465,000,000, and the product is worth about \$200,000,000 a year. Canada is the source of much of the newsprint used in the United States.

The Dominion's exports of manufactured goods now exceed its imports; the balance of trade is quite decidedly in its favor. Exports, which in 1900 were less than \$100,000,000 a year, have increased to more than \$1,300,000,000 a year.

Transportation

Canals. Canada's commercial and industrial development was due in the first place to its facilities for navigation by water, especially the Great Lakes and the Saint Lawrence River.



CANALS OF THE DOMINION

The above map does not include the Welland Canal, which is shown in a map with the article bearing that title. Special maps also show the Georgian Bay and Sault Sainte Marie canals, in articles of the same name.

The early settlers made the Saint Lawrence a great highway; their descendants have improved the channel and have built a system of canals so that vessels may pass up the Saint Lawrence through the Great Lakes to the head of Lake Superior or the foot of Lake Michigan. From the Strait of Belle Isle to Port Arthur is 2,233 statute miles; to Duluth, 2,357 miles; and to Chicago, 2,289 miles. Ocean-going vessels ascend the Saint Lawrence River as far as Montreal, 1,003 miles from the Strait of Belle Isle. From Montreal westward smaller vessels pass through nine canals, in order, as follows: Lachine, Soulanges, Cornwall, Farran's Point, Rapide Plat, Galop, Welland, and Sault Ste. Marie, usually called the *Soo*. The total length of these canals is seventy-four miles, and the total lockage, or height overcome by locks, is 553 feet. All of these canals except the last two are usually called the Saint Lawrence canals; they enable ships to avoid the rapids in the river. The newly constructed Welland Canal connects Lake Erie and Lake Ontario, and the Sault Ste. Marie Canal connects Lake Huron and Lake Superior (see WELLAND CANAL; SAULT STE. MARIE CANALS).

Besides these canals on the main line of water communication, there are a number of others, which may be called branches. In actual operation, however, these other canals serve a distinctly local traffic. The Murray Canal, from the Bay of Quinte to Lake Ontario, is used only by coasting vessels and is not on the through line from Montreal to Lake Superior. The Ottawa-Rideau system, connecting Kingston, on Lake Ontario, with Montreal by way of Ottawa, is 248 miles long, but is a canalized river for a large part of the distance. Another important system extends from Sorel, Que., to Chambly, then to Saint Johns, through the Chambly Canal and up the Richelieu River to Lake Champlain. The Trent Canal is a series of short canals or channels between

Lake Huron and Lake Ontario. The hydraulic lift lock on this canal at Peterborough has a lift of sixty-five feet and is the largest lock of its kind in the world. A similar lock at Kirkfield has a lift of fifty feet five inches. The Trent Canal is used only for local traffic. Saint Peter's Canal, on Cape Breton Island, connects Saint Peter's Bay with the Bras d'Or Lakes and practically cuts the island into two.

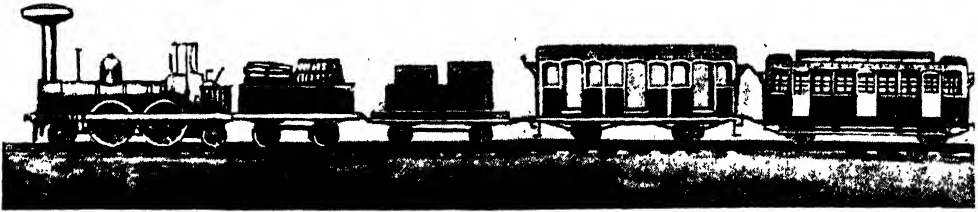
In addition to these canals, plans have been drawn for a number of years for new canals. The largest and most important of these is the Georgian Bay Ship Canal (see the article on GEORGIAN BAY), from the northeast corner of



LIFT LOCK AT PETERBOROUGH

The largest of its kind in the world

Georgian Bay to the Ottawa River, and then along the Ottawa Valley to Montreal. This canal, if built, will enable ocean-going vessels to steam directly from Montreal to Lake Huron and will shorten the water route between Montreal and ports on Lake Michigan and Lake Superior by nearly 300 miles. It is estimated that the construction of the canal will cost \$125,000,000, which is about the total already spent on all the other canals.



FIRST STEAM RAILROAD IN CANADA

From a print in the Chateau de Hamezay

On the Champlain & Saint Lawrence Railway, 1837.

Railroads. Canada, with 40,350 miles of railway, has a greater mileage in proportion to population than any other country except the Australian Commonwealth. Long ago men realized that the development of Canada could not come without intercolonial and transcontinental railways. Not only were railways needed for an economic reason, but for a political one, to serve as a bond of union between provinces so widely separated. The need of railways as an economic and political bond explains why the government has always been willing to grant liberal subsidies to private railway companies; it has itself engaged in some railroad construction, and it now operates all but two of Canada's great railway systems.

Present Status. The outstanding event in transportation in recent years was the consolidation, into a single government railway system, of two great lines with the lines already owned by the Dominion. The new grouping was named the Canadian National Railways. The roads previously under government control and operation were the Intercolonial and the National Transcontinental. The Dominion took over the Canadian Northern in 1917, the Grand Trunk Pacific in 1919, and the Grand Trunk in 1920.

The intervention of the government in railroad affairs which resulted in giving it control of over eighty per cent of the trackage and motive power of the lines in Canada was necessitated by the rapid expansion of transportation lines beyond the needs of the Dominion and by the financial stringency during and after the World War. Only the pioneer transcontinental road, the Canadian Pacific, was able to maintain itself. The Dominion had advanced nearly five-sixths of the \$675,000,000 which was invested in the roads taken into the Canadian National Railways, and it was necessary for the government to assume control.

The Railroads in Detail. The following are brief descriptions of the several important Canadian lines. Though most of them are in the Canadian National group, their history will be of interest:

Grand Trunk, now one of the Canadian National lines. The first railroad in Canada was built in 1836 from La Prairie, near Montreal, to Saint Johns, a distance of sixteen miles. It was operated by horsepower for a year, when in 1837 locomotives were substituted. Ten years later another short line was completed from Montreal to Lachine. Canada's railway system had its real beginning in 1851, when Parliament authorized the construction of a line from Quebec to the western limit of Upper Canada and also a branch from Montreal to Portland, Maine. This line, the Grand Trunk Railway, was completed in 1856.

Since that year, when the main line was completed from Quebec to Sarnia, Ont., on the Saint Clair River, the Grand Trunk gradually increased its mileage to 3,100 in Canada alone, besides numerous connections, either owned or leased, to cities in the United States. The main line extends from Portland, Me., through Montreal to Chicago. Three parallel lines extend across the Ontario peninsula, and these are connected by branch lines, one of which extends to Lake Timiskaming. The road was long famous for the old suspension bridge over Niagara Falls, and for the tubular bridge over the Saint Lawrence at Montreal; and the modern steel structures which have replaced the original bridges are noteworthy examples of engineering skill.

Canadian Pacific Railway. The construction of a transcontinental railway was one of the conditions on which British Columbia entered the Confederation. From the first, the railway was a political issue, and politics prevented progress. The government began the actual work of construction, but in 1881 turned over the task to a group of capitalists, including George Stephen, later Lord Mount Stephen, and Donald A. Smith, later Lord Strathcona and Mount Royal (see subtitle *History*, below). The road was finished in 1885, and its mileage is now over 12,000. The main line extends from Saint Johns, N. B., to Vancouver, B. C. In addition to its main line and branches, the "C. P. R.," as it is generally known, has leased or has traffic rights over several roads which give it connection with ports in the Maritime Provinces and with Boston.

Intercolonial Railway, now a unit in the Canadian National system. The Intercolonial was the first of the great railway systems to be owned and operated by the Dominion government. It was planned in the days before Confederation—hence its name—and after Confederation was completed by the Dominion. It was opened to traffic in 1876, and now has a mileage of over 1,450. The main line extends from Halifax, N. S., to Montreal, by way of Lewis and the south bank of the Saint Lawrence River.

Canadian Northern Railway, now in the Canadian National system. In 1896 the firm of Mackenzie, Mann & Company built a 100-mile railway known as the Lake Manitoba Railway and Coal Company line. Mackenzie, Mann & Company owned the road. From this small beginning developed the Canadian Northern Railway, the third of the great transcontinental systems. This road has opened to settlement a great area in the Northwest, north of the Canadian Pacific and the former Grand Trunk Pacific. The mileage is about 6,000. Through trains from Quebec to the Pacific coast were first operated in 1915.

Grand Trunk Pacific, also in the Canadian National system. This road was also opened to through traffic in 1915. The Grand Trunk Pacific Railway Company was incorporated by Parliament in 1903. It agreed with the government to construct a railway from Winnipeg to Prince Rupert, B. C., on the Pacific Ocean, and to operate a line from Prince Rupert to Moncton, N. B. The section east of Winnipeg was built by the Dominion government and technically known as the National Transcontinental Railway, whereas the line west of Winnipeg was the Grand Trunk Pacific. Under the original agreement, the Grand Trunk Pacific was to operate the entire system from Moncton to Prince Rupert, but on the completion of construction, it refused to operate the lines east of Winnipeg. This section, therefore, was then operated as a part of what was known at the time as the Canadian Government Railways. A number of important branches were built by the government, the most important being the Hudson Bay Railway, planned to extend from Pas, about 180 miles northeast of Prince Albert, to Fort Churchill, on Hudson Bay. From Pas, a branch of the former Canadian Northern furnishes connection with Hudson Bay Junction. This Hudson Bay road, not yet completed, is intended to open a new route to Europe for the grain of the Northwest provinces. See HUDSON BAY.

In railway mileage Ontario exceeds all other provinces, with over 11,000 miles of track; Saskatchewan is second, with nearly 6,500 miles. Quebec, Alberta, and Manitoba follow in order, but each has fewer than 5,000 miles. No other province exceeds 4,000 miles, though none is without railway service. Yukon has about 100 miles.

Education

By the British North America Act of 1867 (which see), the entire control of education is left to the individual provinces. All legislation on educational matters is within the jurisdiction of the provincial legislatures. The constitution makes only a single condition, that the privileges of denominational and separate schools in Ontario and Quebec shall not be

denied. These had existed for so long at the passing of the Act that it was felt that any change would be an injustice.

Broadly considered, the educational systems of the provinces are double ones; there are, first, the non-denominational public schools in Protestant communities, and second, the Roman Catholic schools, chiefly in the French and Irish communities, in which the teachings of the Roman Catholic Church are an important part of education. This question of "separate schools" has long been perplexing and has caused much bitterness in politics. The entire question, while it occasionally figures in national politics, is essentially provincial.

In all the provinces, the expenses of the educational system are paid from the public revenues. Each province contributes liberally to all its schools, but the local districts bear the chief burden. Public elementary education is free throughout the Dominion, except in parts of Quebec, where parents or guardians pay certain small fees. All the provinces except Quebec have laws making education compulsory. Each province has a department, or ministry, of education, which enforces throughout the province the laws for uniform training of teachers, uniform textbooks, and uniform examinations and grading of pupils. There are secondary schools, high schools, or collegiate institutes, colleges, and universities in all of the provinces, and in all of them advanced methods are employed.

Over one-fourth of Canada's population is in school attendance, the registrations in all types of institutions exceeding 2,250,000. There are slightly more than 100 colleges and universities, about sixty schools for the training of teachers, more than 20,500 day schools under public control, nearly 700 private elementary and secondary schools and business colleges, and over 300 Indian schools. One-room rural schools are less numerous than they were a few years ago, particularly in the prairie provinces; because of expense of maintenance for small enrollments they are in numerous instances being joined into two-room schools, with two women teachers who may share living expenses.

The number of teachers employed in all types of schools, from the kindergarten to the university, is over 76,000. The annual expenditures of the Dominion for education exceed \$135,000,000.

The Dominion Government

Character of the Government. The British North America Act of 1867, together with the amendments of 1871 and 1886, constitutes the supreme law of the Dominion. This Act was passed by the British Parliament to establish a union between the "Provinces of Canada,

Nova Scotia, and New Brunswick," with a Constitution "similar in principle to that of the United Kingdom." It specifies the organization and method of government. It assigns to the provinces and to the Federal government their respective powers. It is noteworthy that any

powers not specifically granted to the provinces are reserved to the Dominion. This is the opposite plan from that adopted by the United States, whose Constitution specifies the powers to be exercised by the national government and leaves all others to the states.

The Constitution of Canada was the first attempt to adapt British principles of government to a Federal union. The government bears striking resemblances both to that of Great Britain and to that of the United States. It furnishes perhaps the most remarkable example in all history of various types of government in combination. That the Dominion of Canada is a dependency is in only a remote sense true; it is so only in the fact that the British sovereign is the head of the state. It is in reality a self-governing democracy, a member of the British Commonwealth of Nations, equal in power with the mother country and other members of the Commonwealth, and a member of the great British Empire.

The country has both representative and responsible, or Parliamentary, government. The United States has representative, but not responsible, government, for the elected representatives have no direct control over the executive. The Dominion is a Federal government; that is, it includes a number of provinces which possess distinct powers for provincial purposes. Yet each of these provinces is a part of a greater whole, and its individual interests are subordinated to the general good. To sum up, therefore, these paradoxical facts, the Dominion is dependent, yet self-governing; monarchical, yet democratic; a group of states, yet a single union.

Division of Functions. The three functions of government are to enforce law, to make law, and to interpret law. These functions are exercised by the three branches of the Dominion government, the executive, the legislative, and the judicial. The Premier is the head of the executive department. Parliament is the law-making body, and by the authority of the British North America Act it has also established the courts which interpret the law.

Governor-General. As a result of the Imperial Conference of 1926, the status of the Governor-General of Canada has been changed. The decision of the Committee on Inter-Imperial Relations, at the Imperial Conference, is as follows:

The Governor-General of Canada is a representative of the Crown, holding in all essential respects the same position in relation to the administration of public affairs in the Dominion as is held by His Majesty in Great Britain, and is not a representative or agent of His Majesty's government.

The recognized official channel of communication is to be between government and government direct. The Governor-General will

not be the formal official channel of communication between His Majesty's government of Great Britain and His Majesty's government in Canada, but he will be supplied with copies of all documents of importance and, in general, be kept as fully informed as is His Majesty in Great Britain, on all public affairs. He still has the right, in theory, to reserve bills passed by the Dominion Parliament, for consideration in the Imperial Parliament.

The Ministry. By the terms of the British North America Act the executive council which advises the Governor-General is called the "King's Privy Council for Canada." Some of

the members of the council act as the heads of executive departments; they comprise the "Ministry," "Cabinet," or "Government." When the Governor-General appoints a minister, he first designates him as a member of the Privy Council and then as the head of a department. Privy councillors retain their rank after they resign from office, but this is an honor which carries no responsibilities with it. A minister who has been defeated for reelection remains a member of the council and is technically one of the Governor-General's advisers, but he is seldom called upon for his opinion. Councillors are sometimes chosen as "ministers without portfolios" in order to place them in the Cabinet, without requiring them to assume executive duties.

The members of the Cabinet hold office only as long as they are supported by a majority in the House of Commons. They are responsible directly to the House, which is the direct representative of the people. This system is called responsible government. Most of the Cabinet members sit in the House of Commons, but three or four are usually Senators. All ministers must be members of Parliament, and the government, therefore, is in the hands of what is really a committee, made up of members of the two Houses of Parliament. The number of ministers usually varies from seventeen upward, although there is no fixed number. The permanent head of a department is the deputy-minister, who holds office under the civil service regulations (see CIVIL SERVICE IN CANADA). The duties of the various ministers are summarized below:

1. The President of the Council presides over the meetings of the Ministry. He has no executive duties,



Photo U & U

VISCOUNT WILLINGDON
Governor-General of Canada, who succeeded Lord Byng.

except such as relate to the work of the council as a whole. This office is usually, though not necessarily, held by the Premier (see subhead, below)

2. The Minister of Justice and Attorney-General of the Dominion is the legal adviser of all the government departments. The administration of justice, including the control of the Royal Canadian Mounted Police and of prisons, is in his hands. He also reviews all the laws passed by the provincial legislatures.

3. The Minister of Finance has charge of the Dominion finances. He presents the annual budget to Parliament, explains the government's financial policy in regard to

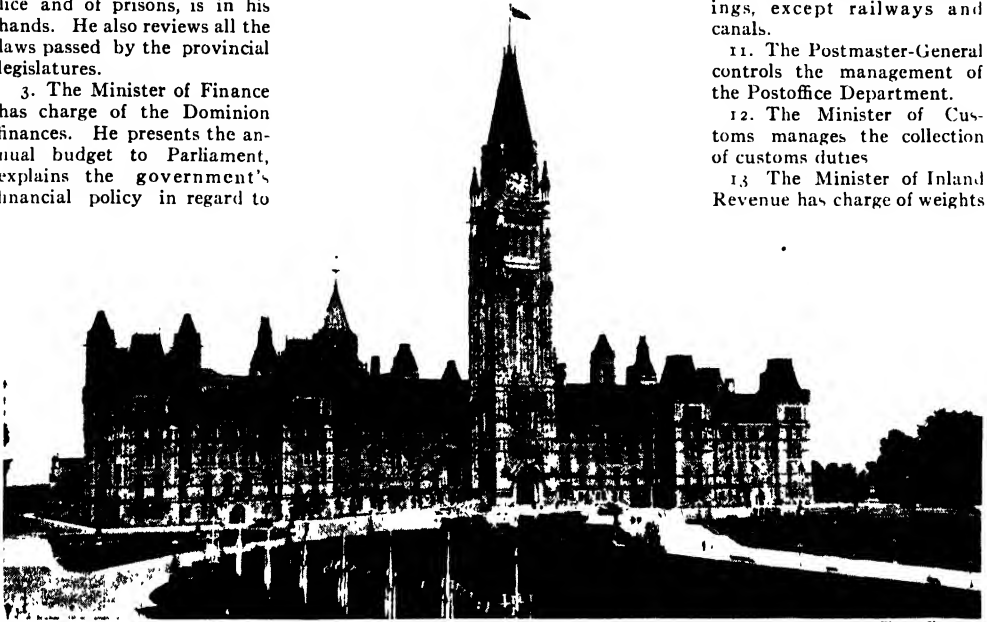
9. The Minister of Railways and Canals is responsible for the supervision of the railways of the Dominion government, and for a general supervision of the government canals. He also has some duties in connection with general problems of transportation

10. The Minister of Public Works has charge of the construction and maintenance of all public works and buildings, except railways and canals.

11. The Postmaster-General controls the management of the Postoffice Department.

12. The Minister of Customs manages the collection of customs duties

13. The Minister of Inland Revenue has charge of weights



THE PARLIAMENT BUILDING AT OTTAWA

Photo Keystone

It was patterned after the Houses of Parliament in London, including Big Ben and the chimes.

the raising and expenditure of revenue, and is responsible for the collection and distribution of funds. See BUDGET.

4. The Minister of Trade and Commerce executes all laws relating to commerce, industry, and allied subjects which are not definitely assigned to some other department. He is also in charge of the census and statistics branch, which was formerly a part of the Department of Agriculture.

5. The Minister of Agriculture, besides the division of industry which gives him his title, has charge of public health, copyrights, trade-marks, and patents.

6. The Minister of Marine and Fisheries has supervision of the ocean and inland fisheries, of the light-house and life-saving service, of the examination of ships' captains and mates, harbors, piers, and docks; and practically the entire field of fisheries and navigation. The Minister of Marine and Fisheries also acts as Minister of Naval Service.

7. The Minister of Militia and Defense is responsible for the administration of all military affairs, including the military college at Kingston, Ontario. He acts as president of the militia council, which is composed of the Minister, the Deputy Minister, the Chief of the General Staff, and three other officers of the army; this council advises the Minister of Militia.

8. The Minister of the Interior is in charge of the government of the Northwest Territories, the Indians, public lands, forestry branch, and the geological survey.

and measures and of all excise and other internal taxes.

14. The Minister of Labor acts as arbitrator in labor troubles, and under specified conditions may intervene to end strikes. He may also investigate labor conditions generally and issue reports on them.

15. The Minister of Mines investigates the mineral resources and conditions of the mining industry and issues reports of his findings. He has comparatively few duties and usually holds another position in the Ministry.

16. The Secretary of State registers all documents under the great seal of the Dominion, has charge of public printing and of all official correspondence between the Dominion and provincial governments.

17. The Secretary of State for External Affairs has charge of relations with the British and foreign governments. This office is usually held by the Premier.

Premier. The Premier is literally *first* member of the Ministry. He is chosen by the Governor-General to form a Ministry, although the formal power of appointing ministers is vested in the Governor-General. Legally, no such person as Premier exists, but the name is given to the head of the Ministry; usually he acts as president of the Privy Council. The Premier is the head of the Cabinet, or Ministry; he is the leader of the party in power, and he



FIRST PARLIAMENT BUILDING, TORONTO (1796-1813)

is, under a system of responsible government such as that in Great Britain and Canada, the head of the legislative branch of the government. He is also, in practice, the executive head of the government, as the Governor-General does not now act without his advice and consent.

If the Premier dies or resigns, the Cabinet is thereby dissolved, and the ministers hold office only until a new Premier is appointed and their successors are named. If the government, that is, the Ministry, is defeated on some important question in Parliament, there are two courses open to the Premier and his ministers. They may resign, whereupon the Governor-General selects a new Premier, usually the leader of the opposition, or they may convince the Governor-General that they still hold public confidence and that the vote does not represent popular sentiment. In this second case, the Governor-General may dissolve Parliament and call for a general election.

Parliament. The legislative functions are exercised by a Parliament of two houses. The upper house is the Senate; the lower, the House of Commons. In nearly all respects, the rights and powers of the two houses are exactly the same, but any bills for raising revenue or appropriating funds must originate in the House of Commons. The upper house may reject such a bill as a whole, or it may accept it, but it is not allowed to amend it. This differs from the practice in the United States, where the Senate may amend financial bills, although it may not originate them. The powers of Parliament are listed in the British North America Act under twenty-nine heads; the provinces are not allowed to legislate on any subject which affects the entire Dominion.

Membership. The Senate was originally composed of seventy-two members—twenty-four each from Ontario and Quebec and twelve each from New Brunswick and Nova Scotia. The theory of this division was that the Senators should represent the interests of a province rather than of a local district. Since 1867 the admission of other provinces has made some readjustments necessary, and the total mem-

bership is now ninety-six. The Senators are appointed by the Governor-General, on the advice of the Privy Council. The political party in power, therefore, controls the nomination of new Senators. A Senator must be thirty years old, and must own \$4,000 worth of real or personal property in the province for which he is appointed. The appointment is for life, but a Senator may resign, and his seat automatically becomes vacant if he becomes a bankrupt, is convicted of treason or other crimes, transfers his allegiance to some other power, or loses the property or residence qualification.

The House of Commons represents the body of voters more directly than does the Senate, for its membership is constantly changing. No property qualification is required, but a member must be a British subject, either by birth or naturalization. He need not reside in the district for which he is elected; this practice is like that of Great Britain but unlike that of the United States. The British North America Act fixes the representation of Quebec at sixty-five members, and each of the other provinces is allowed a number of members which bears the same relation to its population as sixty-five is to the population of Quebec. Quebec, by the census of 1921, has one member of the House for 36,326 inhabitants. The population of any province divided by 36,326 gives the number of representatives to which it is entitled in the House. The total number of members, in accordance with the Representation Act of 1924, is 245, divided as follows: Alberta, 16; British Columbia, 14; Manitoba, 17; New Brunswick, 11; Nova Scotia, 14; Ontario, 82; Prince Edward Island, 4; Quebec, 65; Saskatchewan, 21; Yukon Territory, 1. The redistricting bill was passed by Parliament in the spring of 1924.

The Courts. The British North America Act did not provide Dominion courts, but it authorized Parliament to provide for the "constitution, maintenance, and organization of a general court of appeal for Canada, and for the establishment of any additional courts for the better administration of the laws of Canada."

The creation of a Supreme Court was delayed until 1876, and since that time two other Federal courts, the Exchequer Court and the Admiralty Court, have been established. These three are the only regular Dominion courts. In one sense, however, the courts of the provinces are Dominion courts, for the judges are appointed and paid by the Dominion government; the procedure and jurisdiction of these courts is fixed by the provinces.

Supreme Court. This is the highest court in Canada, and has appellate jurisdiction on all civil and criminal cases. Besides the Chief Justice, there are five puisne judges, all appointed for life. *Puisne* is an old form of the word *puny*, and is pronounced in the same way; it designated these judges as *associate*, or *lower*, judges.

Exchequer Court. The functions of this court were originally exercised by the Supreme Court, but in 1887 a separate court was established. It has original jurisdiction in all claims or actions against the Crown, and in all cases affecting the property or other interests of the Crown. It also has jurisdiction in cases affecting the issuance of copyrights, trade-marks, and patents.

Admiralty Court This is not technically a separate court, but a division of the Exchequer Court. The duties of the latter are so heavy that special local judges have been appointed

to hear cases in any way relating to shipping, navigation, trade, and commerce in Canadian waters. Admiralty business may be brought before the Exchequer Court at Ottawa, or before one of the local judges in admiralty who hold court at Toronto, Quebec, Halifax, Saint John, N. B., Victoria, Charlottetown, and Dawson. See ADMIRALTY.

Provincial Government. The details of provincial government are given in the articles on each province, elsewhere in these volumes.

By the British North America Act, the provinces are given entire control of a specified number of subjects, and their jurisdiction is limited to these, as follows:

- (1) Amendment of the provincial constitution, except in regard to the office of lieutenant governor
- (2) Direct taxation to raise money for provincial purposes.
- (3) Borrowing money on the credit of the province
- (4) Provincial offices, and the appointment and payment of provincial officers
- (5) Reform and penal institutions, also hospitals, asylums, and charitable institutions
- (6) Municipal institutions
- (7) Shop, saloon, auctioneers', and other licenses
- (8) Public works, except such as are inter-provincial in character.
- (9) Guarantee of civil rights and property
- (10) Administration of justice
- (11) Matters of local or private nature
- (12) Education

G H I

History of Canada

Age of Discovery and Exploration. The sagas of the Northmen recite the deeds of one Leif Ericson, "a large man and strong, of noble aspect," who is said to have reached the shores of North America, probably the Labrador coast, in the year 1000. The sagas further tell how he and his men sailed southward to a land of many large trees, which may have been Nova Scotia. That the brave Vikings reached Greenland is certain, but whether or not they ever reached the shores of Canada cannot be definitely known, for they left no traces of their visits. See VIKINGS; ERIC THE RED.

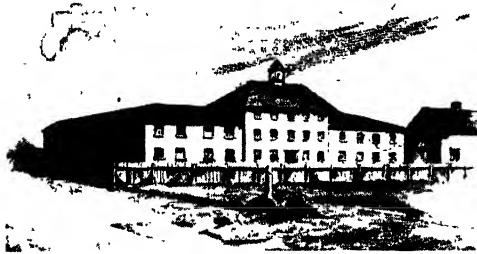
The first voyager known to have reached the mainland of North America was John Cabot, who discovered the bleak Labrador coast in 1497 (see CABOT). Like the other early navigators, Cabot was looking for a northwest passage to India, but he also hoped to "bring back so many fish that England will have no more business with Ireland." A part of his ambition was realized, for soon afterward fishermen from Europe began to pay yearly visits to the Newfoundland Banks. The voyages of John Cabot and his son Sebastian did not disclose a new way to India, but they brought fishermen and fur traders to America. In 1534 a brave seaman of Saint Malo, France, sailed westward to take possession of all lands he should find for

King Francis I of France. This was Jacques Cartier (which see). He entered the Gulf of Saint Lawrence and coasted along the shores of Labrador, which he reported was barren enough "to be the land allotted of God to Cain." Cartier's experiences, however, aroused great interest in France. He made a second and a third voyage, discovered the Saint Lawrence River, and sailed up it as far as Hochelaga, an Indian village on the present site of Montreal. In connection with Cartier's third voyage an attempt was made to found a permanent settlement about ten miles up the river from Hochelaga, but after a terrible winter, the colony was abandoned.

For more than half a century thereafter, France neglected America. The failure of the colony, the cold winters, and the barren coast discouraged the hardiest of adventurers. Not until the beginning of the seventeenth century did the French again turn to the work of exploring and settling this new land which they claimed.

Coming of Fur Trader, Missionary, and Colonist. Although the French as a nation paid no attention to this unexplored land across the seas, fishermen from France, as well as from Spain, Portugal, and England, continued to visit the Grand Banks. On one occasion there

were 150 French ships off the Banks, and it was a rare day when at least one ship did not sail from France bound for the fishing grounds. Gradually, the men of the sea recognized the profits to be made on land. Some of them



YORK FACTORY

For many years one of the main posts of the Hudson's Bay Company. At the mouth of the Nelson River, opposite Port Nelson.

built huts near the shore and began to exchange knives, hatchets, liquor, and trinkets of all kinds for the furs which the Indians had secured.

The work of exploration was renewed in 1603 by Samuel de Champlain, the "Father of New France," and in the next year he took part in founding the settlement of Acadia (which see). A company was organized to colonize the land now included in New Brunswick and Nova Scotia; it was given a monopoly of the fur trade, but one of the conditions attached to the monopoly was that the natives should be converted to Christianity. Acadia led an uncertain existence for a century and a half. It was alternately held by the French and English, and more than once it was all but wiped out.

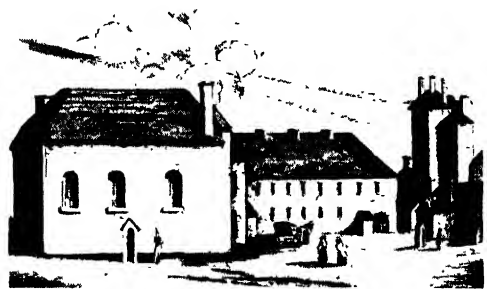
The first permanent settlement was made at Quebec in 1608 by Champlain (see CHAMPLAIN, SAMUEL DE). Until his death in 1635 he labored in every possible way to make the colony a success. He encouraged exploration of the interior, stimulated the fur trade, sent missionaries to the Indians, took part in Indian wars, and at the same time encouraged settlement. In 1642 Sieur de Maisonneuve was sent from France to found a colony, and he named it Villa Marie. It later became Montreal.

In 1627 the Company of New France, generally called the Company of the Hundred Associates, was given a monopoly of the fur trade throughout the French possessions. Far from fulfilling its contract to add 4,000 colonists within fifteen years, the company occasionally discouraged settlement. But until 1663 New France remained under the control of the company. In that year Louis XIV dissolved the company, and made New France a royal colony. He chartered a new company, the Company of the West, to enjoy a monopoly of trade; it was

no more successful than its predecessor, and its charter was annulled in 1674.

Worse than the failure of France to give proper support to the colony were the troubles within the colony itself. The Iroquois were frequently on the warpath and made life miserable for the colonists. There was also much quarreling among the traders, among the priests, and finally between the bishop and the governor. Monseigneur de Laval, the first bishop of Canada, was strong enough to secure the dismissal of two governors with whom he had quarreled, but the later governors were little inclined to take advice from the priests.

New France under Royal Government. For a short time the new royal government promised a great future for New France. The colony had been on the verge of disaster, but it was now flourishing. In 1665 two thousand colonists arrived, with horses and sheep. Three able officials arrived in the same year—Sieur de Courcelle, the governor; Jean Baptiste Talon, the intendant, or treasurer; and Marquis de Tracy, a general. De Tracy's first attacks on the Iroquois failed, but as he had been sent out to destroy or subdue them, he tried again, this time with success. The Iroquois sued for peace, and for twenty years the colonists were free from Indian attacks. Many of the soldiers who served under de Tracy settled in Canada, and annual shipments of colonists continued to arrive. Courcelle was recalled in 1672, and was succeeded by Frontenac, the greatest governor since Champlain. Frontenac ruled with a firm hand; he held the Iroquois in check, but he frequently quarreled with the intendant and other officials, who resented his attempts to



BISHOP'S PALACE, QUEBEC

Where the first Parliament of Lower Canada met, in 1792.

regulate the fur trade. The king, in disgust, finally recalled both Frontenac and Duchesneau, the intendant, in 1682.

Not the least of Frontenac's services to New France was the opening of the West. The Jesuits had heretofore given most of their attention to the Hurons, but the practical destruction of this nation by the Iroquois left

them without a field. Frontenac encouraged them to go into the unexplored West, and he gave aid to Marquette and Joliet, to La Salle and Tonty. These men discovered the Mississippi and traced it to its mouth, thus giving France a claim on the great interior valley which it finally surrendered to the United States in 1803. Posts were established at Mackinac, Niagara, and other points, and New France seemed embarked on a new era of prosperity. See MARQUETTE; JOLIET; LA SALLE.

The French, however, were not without ambitious rivals, for in the north the Hudson's Bay Company (which see) was taking away the trade of the northern Indians, and on the southeast, Albany was becoming a great center for marketing furs. Frontenac's successors, moreover, were unable to handle the Iroquois Indians as Frontenac had done. Attempts to conquer or conciliate resulted in enraging them, and for several years they put an end to the French fur trade. Their raids had a terrible climax at Lachine, which they destroyed to a house and to a man. In this crisis, King Louis XIV turned again to Frontenac, who seemed the only man, in spite of his seventy years, to save the colony from destruction.

The Struggle for New France. The reappointment of Frontenac coincided with the beginning of the struggle between France and England—France to keep New France, England to conquer it. There had been wars between them before this time, and when the French in Canada were not fighting both the Iroquois and the English, they were fighting the Iroquois. But it was now clear that the French were planning a great American empire, while William III of England was beginning to organize Europe against French aggression. In 1689 the real struggle began, and for three-quarters of a century it continued, with occasional periods of peace or truce, during which the nations made further preparations to renew the conflict.

It was the ultimate aim of the French to hold the English to the Atlantic seaboard, or even to drive them out of North America. Frontenac at once began attacks on the New England colonies, and for years the colonies suffered the horrors of border warfare. The success of their raids encouraged the French, but infuriated the English, who made an attempt with a small fleet to capture Quebec and Montreal. The Peace of Ryswick, in 1697, brought a temporary halt to the hostilities, and in the next year Frontenac died. Peace did not last long; in the next years, three more wars were fought (for details, see FRENCH AND INDIAN WARS). After the fall of Quebec, in 1759, the triumph of England became almost inevitable, but the French made desperate attempts to regain Quebec and hold Montreal. When no aid came to them from France, the French

army in America was driven to surrender, in 1760. By the Treaty of Paris, in 1763, France surrendered its possessions in America to England.

After Britain's Conquest. The change from French to British rule was made without much disturbance. Some of the Indians, led by Pontiac, a chief of the Ottawas, rose against their new masters; but the French as a whole were glad to return to peaceful occupations. A few of the seigniors, merchants, and higher officials—perhaps 400 in all—returned to France, but the habitants were quickly reconciled to British rule. For three years the conquered territory was under military rule, until George III reorganized the government by proclamation, in 1763.

Prince Edward Island and Cape Breton were added to Nova Scotia, Anticosti was given to Newfoundland, and the main colony was organized as a separate province under the new name of Quebec.

In 1763 there were 60,000 French and only 500 English in Canada. The home government felt that the incoming English settlers would soon absorb the French element, but in this opinion they were mistaken. Fortunately, the governor, General James Murray, tried to satisfy the majority of the population. He had no high opinion of the Englishmen in Quebec, whom he called "men of mean education, traders, mechanics, publicans, followers of the army." Discontent remained, however, and the necessary reforms in the government were made by the Quebec Act (which see), in 1774. This Act met some bitter opposition in England because of the great concessions it made to the French-Canadians, but the wisdom of its authors was soon to be proved, for in 1775 and again in 1812 the French-Canadians refused the chance to rebel against England, and even helped to fight England's battles.

At the outbreak of the Revolutionary War, the New England colonies tried hard to secure the coöperation of Quebec, and when their efforts failed, they made vigorous attacks on the loyal colony (for the military events of this period, see REVOLUTIONARY WAR IN AMERICA). The war brought one great gain to Canada. Some 40,000 colonists who remained loyal to the king and the United Empire abandoned their homes in the United States and crossed the border into the loyal colony. Many of them left valuable estates or gave up influential and remunerative positions as ministers, judges, and other officials. From a life of comparative ease, they plunged again into a wilderness. Many settled in Nova Scotia, some in Eastern Quebec; to this day their descendants are the most important single element in these provinces.

The Struggle for Responsible Government. As the number of English-speaking settlers in-

creased, it became evident that the Quebec Act did not provide a satisfactory government. In 1791, therefore, the Constitutional Act divided the colony into Upper Canada and Lower Canada. Upper Canada had a population of 20,000, mostly United Empire loyalists; Lower Canada had six times as many people, mostly French-speaking. For fifty years Upper and Lower Canada remained separate provinces, each with its own government. For half a century the history of Upper and Lower Canada was a struggle for representative government, which under autocratic rule was impossible. A similar struggle was going on in New Brunswick and Nova Scotia.

Bitter political strife was temporarily pushed aside by the War of 1812 (which see), when the Canadians, both French and English, rallied in defense of their country. Nor did politics in the East prevent the exploration and development of the West. There were the two great fur-trading companies, the Hudson's Bay Company and the Northwest Company, which later joined forces. Settlements were made in the Red River Valley, and the explorations of Sir Alexander Mackenzie, Simon Fraser, and David Thompson opened up this wilderness and laid the basis for a great Dominion extending from the Atlantic to the Pacific.

War and expansion had no effect on the political issues in the provinces. In Upper and Lower Canada, the radicals actually resorted to open rebellion to secure the reformation of the government. This struggle was called the "Patriot War." Under Louis J. Papineau in Lower Canada and William Lyon Mackenzie in Upper Canada, the radicals took arms, but at the first contact with the militia the rebels were dispersed. The rebellion was doomed to failure, for only the most impulsive and thoughtless of the people had been carried away by the eloquence of a few leaders. The great mass of the people were not merely loyal, but were disgusted with the violent methods of the reformers.

The rebellion of 1837 naturally brought discredit on all the reformers, even Robert Baldwin and the other moderate Liberals. But it had one great result: It called the British government's attention to the critical state of affairs in the Canadas and led to the Act of Union. The Earl of Durham was appointed Governor-General of British North America and High Commissioner to investigate the abuses in the government, and as a result, Upper and Lower Canada were reunited by act of the British Parliament, in 1841.

The operation of the Act of Union disappointed the reformers. The governor and the legislative council appointed by the Crown still maintained control. In the legislative assembly the two provinces elected an equal number of representatives, but the rapid growth of

Upper Canada soon caused a demand for representation by population. Meanwhile, the first three governors, Sydenham, Bagot, and Metcalfe, refused to recognize the responsibility of the executive council, or Ministry, but Lord Elgin, in 1848, admitted the principle of responsible government, and since that date Canada has been practically self-governing.

In Nova Scotia and New Brunswick, there had been similar struggles for responsible government. The British government finally instructed the governor of Canada to rule in accordance with the well-understood wishes of the people "and summon to the Ministry those who held the general confidence and esteem of the province," and within a year or two the Maritime Provinces compelled their governors to adhere to the same principles.

During the next fifteen years, a succession of Ministries carried on the government. There was always some friction between Upper and Lower Canada, and in each province there were local issues which further divided the great political parties. As a result, no Ministry ever had a large majority in the assembly, and none stayed in office very long. The most prominent in this changing array of ministers were Allan MacNab, Robert Baldwin, Sir Louis Lafontaine, Sir Etienne Taché, Sir John A. Macdonald, George Brown, Sir Francis Hincks, John S. Macdonald, and Thomas D'Arcy McGee.

Confederation. The idea of confederation, that is, a Federal union in which each province should retain control of its local affairs while transferring its general powers to a central government, was not a new one in 1864. It had been suggested early in the nineteenth century, and the Earl of Durham had been one of its ardent supporters. It was also gaining ground both in Upper and in Lower Canada, chiefly because real government was rapidly becoming impossible there under the Act of Union. Finally, in 1864, after one Ministry had succeeded another in an apparently endless chain, George Brown proposed a coalition Ministry, including men of all parties, to work for a union.

While the statesmen in the two Canadas were thus beginning to put their heads together, the Maritime Provinces became alarmed at the possibility of war between Great Britain and the United States (see TRENT AFFAIR); they considered the advisability of a union and called a conference of delegates to meet at Charlottetown, P. E. I. When the Canadians heard of this coming conference, they asked and received permission to send a delegation, which included John A. Macdonald, Georges E. Cartier, and George Brown. The proposed union of the Maritime Provinces was overshadowed by the greater plan of union of all the provinces, and the Charlottetown Confer-

ence adjourned after deciding to hold a second conference at Quebec a month later. It was at the Quebec Conference that a series of seventy-two resolutions embodying a plan of government was adopted.

The action of the conference was received with joy in Great Britain and in Upper and Lower Canada. Newfoundland and Prince Edward Island rejected the plan entirely, and New Brunswick and Nova Scotia accepted it only after much debate and delay. Delegates were sent to England to present the resolutions to the home government, and in March, 1867, Parliament passed the British North America Act providing for a union of Canada, Nova Scotia, and New Brunswick as one Dominion of Canada. The Act, except in a few minor details, followed the plan of the resolutions adopted by the Quebec Conference.

Expansion of the Dominion. The British North America Act provided for the division of Canada into two provinces, Quebec and Ontario, previously known as Lower and Upper Canada, respectively. It also made provision for the addition of other parts of British North America to the new Dominion. During the first session of the Dominion Parliament a resolution was passed calling for the annexation of Rupert's Land and the Northwest to Canada. One of the arguments in favor of this change was that the Hudson's Bay Company was interested in its own trade rather than in the development of the West, and also because of the possibility of aggression by the expanding United States. Under pressure from the British government, the company finally surrendered its control of the Northwest; it received £300,000 and one-twentieth of all the land lying south of the north branch of the Saskatchewan River and west of Lake Winnipeg, and it also retained its posts and its trading privileges.

Red River Rebellion. The Hudson's Bay Company formally surrendered its territorial rights to the British government on November 19, 1869. In anticipation of the further transfer to the Canadian government, Hon. William McDougall had already been appointed lieutenant governor of Rupert's Land. The news that he was on his way to Fort Garry (Winnipeg) was the signal for an uprising of the Metis, or half-breeds, in the Red River Valley. The Metis, ten thousand of them, had not been consulted about the change in government, and they were aroused by the possibility that the new government would place restrictions upon them and would perhaps even drive them from their homes. A number of Fenians and Americans, agitating for annexation to the United States, added to the excitement, but the French half-breeds, led by Louis Riel, formed the storm center. Riel was a brilliant man, eloquent and magnetic, but vain and self-seeking to an extraordinary degree. He organized a

"provincial government," forbade McDougall to enter Rupert's Land, and, to terrorize his opponents, executed Thomas Scott, a young Orangeman from Ontario. Hitherto, the rebellion had created little interest in Eastern Canada, but this cold-blooded execution raised a storm of indignation. An expeditionary force was quickly gathered and placed under the command of Colonel (later Lord) Garnet Wolseley. Before the expedition reached Fort Garry the rebels dispersed, and Riel fled across the border to the United States. (See RIEL, LOUIS.)

New Provinces. While the troops were on the way westward, the Dominion Parliament passed an act (July 15, 1870) creating the province of Manitoba. The arrival of the soldiers at Fort Garry, whose name was at this time changed to Winnipeg, was followed almost at once by that of Sir Adams Archibald, the first provisional governor.

In 1871 British Columbia finally agreed to enter the Dominion, subject to a number of conditions, the most important of which was that a transcontinental railway should be begun within two years and completed within ten years. The failure of the government to fulfill its contract nearly led to the withdrawal of British Columbia from the Dominion, but with the driving of the last spike, in 1885, British Columbia was firmly bound to the other provinces.

Prince Edward Island, which had been one of the most vigorous opponents of Confederation, was the next to join, and in 1873 became a province. The Dominion government assumed the heavy provincial debt and also bought the rights of certain absentee landowners. The Dominion now included all of British North America except Newfoundland. To remove any possible doubt as to the Canadian jurisdiction of the unoccupied Northwest, in 1878 an imperial order in council was issued, annexing to the Dominion all British possessions in North America except Newfoundland, which remains to this day a separate colony.

For more than twenty-five years the organization of the Dominion remained unchanged, but by the end of the nineteenth century there was a strong demand for better government in the Northwest Territories. This vast section was growing rapidly in population, and the loose territorial government was unsuited to the new conditions. Finally, in 1905, Parliament created two new provinces, Alberta and Saskatchewan, including in them the old districts of Alberta, Assiniboia, Saskatchewan, and Athabasca. Thus a solid row of provinces stretched from ocean to ocean.

In 1912 a further change was made in the provincial boundaries of Manitoba, Ontario, and Quebec. The greater part of the old district of Keewatin was divided between Manitoba

and Ontario, and all of Ungava was added to Quebec. The Northwest Territories (which see) now include only the districts of Franklin, Mackenzie, and part of Keewatin.

National Problems. The unification and expansion of the Dominion were not accomplished without many difficulties. The organization of a Federal government brought in its train a series of national problems, but

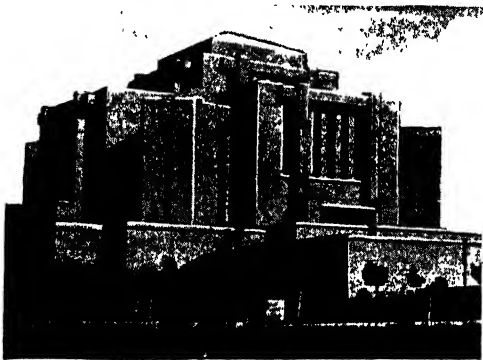


Photo Keystone

A MORMON TEMPLE

It is at Cardston, Alta., and is one of the finest examples of architectural beauty on the American continent.

many of the people were still too much absorbed in local issues to get a proper perspective of the new questions which had to be answered. Lord Monck, the first Governor-General, called on Sir John A. Macdonald, who had been foremost in the Confederation movement, to form the first Ministry. Sir John, or "John A.," as he was popularly known, summoned to his aid able men of all parties, among them Sir A. T. Galt, Sir Georges E. Cartier, Sir Alexander Campbell, and William McDougall.

At the first general election, in August, 1867, when this Ministry appealed to the country for a vote of confidence, it was overwhelmingly defeated in Nova Scotia. For about two years Nova Scotia agitated for the repeal of the British North America Act, even sending a delegation to appeal to the British Parliament. The Imperial government refused absolutely to allow Nova Scotia to withdraw from the union, and a compromise was finally effected, by increasing the amount of the annual subsidy to be paid to the province by the Dominion.

The first years of the Macdonald Ministry were occupied chiefly in organizing the new government. Postal rates were unified and the postoffice placed under the control of a single department, the tariff was systematized, and a civil service and a militia were established. A national banking system was created by an act of 1871, and the Intercolonial Railway was opened to traffic in 1876. The most serious

difficulties arose in connection with the extension of the Dominion to the west. The Red River Rebellion (see above), while easily suppressed, caused great anxiety, and the Pacific railway was a political issue for ten years.

Foreign Policies. Without doubt the most notable achievement of Macdonald in dealing with foreign relations was the settlement of a number of long-standing disputes between the United States, on the one hand, and Canada and Great Britain, on the other. At the request of the Canadian government, Great Britain asked the United States to make a peaceful settlement of the questions in dispute. A joint commission was appointed, with Macdonald as Canada's representative, which met at Washington, the capital of the United States, in February, 1871. The United States claimed that Great Britain should pay for the damage inflicted by the *Alabama*, a Confederate cruiser which was fitted out in England (see ALABAMA, THE). This claim the commission submitted to arbitration. The Canadian claim for damages from the Fenian raids was withdrawn by the Dominion at the request of the Imperial government, but in return for this surrender, Great Britain guaranteed a loan for the construction of Canadian railways. The Saint Lawrence River and the Great Lakes were opened to ships of both countries, and the Oregon boundary was at last definitely settled. The fisheries dispute was turned over to a commission which held sessions at Halifax, N. S., and granted the United States the unrestricted use of Canadian waters for ten years in return for a cash payment of \$5,500,000. The Treaty of Washington in this way disposed of several troublesome problems.

Fall of the Conservatives. When British Columbia entered the Dominion in 1871, it was with the understanding that a transcontinental railway would be begun at once. In 1872 two companies of Canadian capitalists, one headed by Sir Hugh Allan, the other by Hon. David Macpherson, sought a charter for the construction of this railway. While negotiations were under way to unite the two companies, the charge was made in the House of Commons that Macdonald and certain other members had received and used money furnished by Sir Hugh Allan to influence voters in the elections of 1872. While it did not appear that Macdonald or any other member of the Ministry had profited personally from these transactions, it was generally admitted that Allan had paid out large sums of money with the understanding that his company would be awarded the contract. Public feeling became very intense, and the Macdonald Ministry resigned in October, 1873, before the charges could be brought formally. The Governor-General called on Alexander Mackenzie, the Liberal leader, to form a new Ministry.

Mackenzie and Liberal Rule. The new Premier, Mackenzie, soon announced that it would be impossible to build the railroad as had been planned. He proposed that the Dominion should itself undertake the task and build the road a little at a time, as its finances permitted. This suggestion was unsatisfactory to British Columbia, which forced the government to agree to build a wagon road and telegraph line at once and to complete the railway by 1890. During the years that the Mackenzie Ministry held office a number of important laws were passed. One established the Dominion Supreme Court, another adopted the Australian ballot, and a third organized the Northwest Territories. Immediately after the Red River Rebellion, the Northwest began to fill with settlers, who needed some organized government. A new feature of this government, which has since been copied in Australia and elsewhere, was the Royal Northwest Mounted Police, which later became the Royal Canadian Mounted Police.

Though the Liberal Ministry was responsible for these and other advances, it was not very popular. It was handicapped in its policies by a strongly Conservative Senate and a powerful opposition even in the House of Commons. Canada, moreover, was passing through a period of business depression, which was unjustly laid at the doors of the Liberals. The factories of the United States, which were then suffering from a similar depressed condition, tried to flood Canadian markets with goods they could not sell at home. The opposition, seizing its chance, began to cry for a protective tariff and "Canada for the Canadians." This became Sir John Macdonald's "national policy," on which he fought the elections of 1878 and was returned to power.

Thirteen Years of Conservative Government. From 1878 until his death in 1891, Macdonald was at the helm. A protective tariff was established, and the Canadian Pacific Railway was completed. Macdonald rejected Mackenzie's plan of piecemeal construction, and awarded the contract for the entire job to a new Canadian Pacific Railway Company, of which Lord Mount Stephen (then George Stephen) and Lord Strathcona (then Donald A. Smith) were prominent members. The work of construction was pushed so rapidly that the last spike was driven in November, 1885, five years before the date fixed in the contract.

The construction of the railway caused a second rebellion of the half-breeds led by Louis Riel. After the Red River Rebellion, each of the half-breeds or Metis had been given 240 acres of land, but as the white settlers began to appear, they gave up their lands and settled farther west, on the banks of the Saskatchewan. The coming of the railway, with the possibility that they would again be forced to move, led

the half-breeds into open rebellion, which was quickly suppressed.

While Macdonald lived, he held his party together, and at succeeding elections was returned to power; the Liberals' attempts to make capital out of the tariff issue met with little success. Macdonald's successor as Premier was Sir John J. C. Abbott, who was followed in turn by Sir John Thompson and Sir Mackenzie Bowell. During Thompson's tenure of office the Bering Sea controversy was settled, but the succeeding Ministries were noteworthy chiefly for the dissensions among the Conservatives. In 1896 Sir Charles Tupper assumed office and reorganized the Ministry, but the country had lost confidence in the Conservatives and at the following elections returned the Liberals to power.

The Laurier Ministry. Sir Wilfrid Laurier, the new Premier, was the first French-Canadian to hold that office. During his administration of fifteen years, from 1896 to 1911, Canada showed a remarkable economic development, and correspondingly, a development of national self-confidence and national unity. But this growth of national unity and individuality was no more marked than the strengthening of the ties which bind Canada to the Empire. The power of these ties has been illustrated in many ways. The outbreak of the war in South Africa in 1899 gave the Dominion an opportunity to show its loyalty by sending three contingents of troops. The laying of the Pacific cable from Canada to Australia, the establishment of penny postage throughout the Empire, the granting of preferential tariffs to British goods imported into the Dominion, and the celebration of the Quebec Tercentenary are merely examples of the workings of this national spirit. In 1905 the British garrison in Halifax was replaced by Canadian troops, and Esquimalt, the naval station in British Columbia, was placed under Dominion control.

Internal Development. The great economic development of the Dominion during the last years of the nineteenth century and the first decade of the twentieth was conspicuous. This was in part the result of a moderate tariff which provided low duties on manufactured goods and certain food products and raw materials used by the Dominion, but at the same time provided some protection to Canadian industries. The discovery of gold in the Yukon and the organization of Alberta and Saskatchewan as provinces led thousands of settlers westward. It was nothing but a stroke of genius which led the government to advertise the rich lands of the West. The construction of two new transcontinental railways—the Grand Trunk Pacific and the Canadian Northern, in addition to the Canadian Pacific—opened up a vast territory to settlement and stimulated national pride.

Foreign Relations. From time to time, new disputes have arisen between the Dominion and the United States, or old ones have been revived. Laurier proposed to settle all disputes by the formation of a Joint High Commission. Such a commission was appointed in 1898, the Canadian representatives being Sir Wilfrid Laurier, Sir Louis H. Davies, and Sir Richard Cartwright. The negotiations, unfortunately, were broken off by a sharp disagreement over the Alaska boundary (see ALASKA, subhead *History*); this dispute was not settled until 1903. Also in 1903 the many questions arising from the joint use of the Great Lakes and other boundary waters led to the appointment of a commission to arbitrate these disputes, and in 1908 the two countries reached an agreement on an accurate system of marking the international boundary. At the same time, the fisheries question was being arbitrated by the Hague Tribunal, which upheld the claims of Canada and Newfoundland on all important points.

Reciprocity and Liberal Defeat. For many years the tariff relations between the Dominion and the United States have been unsatisfactory, and attempts have been made from time to time to readjust them. In 1910 an American delegation visited Canada to urge reciprocity (which see), and in 1911 a treaty was formally presented for approval. The treaty was promptly ratified by Congress, but in the Dominion Parliament it met bitter opposition. The debate in Parliament continued from January to May, 1911, and after an interval, for ten days in July. Parliament was suddenly dissolved on July 29, and the issue presented to the country. The general election on September 21 gave the Conservatives a large majority in the House of Commons. The Laurier Ministry promptly resigned, and on October 10 Robert L. Borden (later Sir Robert) formed a new Ministry.

The Borden Ministry. One of the first measures introduced and carried by the new Ministry greatly extended the boundaries of Manitoba, Ontario, and Quebec. Of more vital importance, however, was the change, or attempted change, in the naval policy. Several months after a conference in London, in June, 1912, between Canadian and British ministers, the Conservative government decided to present to the Dominion Parliament certain emergency proposals in regard to the navy. The Borden policy, in brief, provided for the immediate construction of three dreadnaughts, to be built in Great Britain at a cost of \$35,000,000, to form a part of the British navy. In spite of the Premier's repeated statements that this was an emergency policy, the Liberals insisted that the principle of a strictly Canadian navy should not be departed from. Both sides agreed as to the necessity for a naval contribu-

tion, but the government's proposals were defeated in the Senate.

Canada in the World War. Three hours after Great Britain declared war, a special session of the Dominion Parliament was called. For the first time in Canadian history a Prime Minister (Sir Robert Borden) was the leader of a politically united people; the leader of the Opposition, Sir Wilfrid Laurier, called a truce, and party activity ceased for the duration of the war. A great wave of patriotism swept over Canada. Canadians in general realized that the momentous event challenged the freedom of the world. Canada as a free nation under the flag of the Empire realized its duty and opportunity; the response from the heart of the Dominion was instantaneous. It is not easy to express the temper of a people that would have dissolved Parliament itself if that body had not made its decision responsive to the popular will. So determined was the resolve that Canadians should "do their bit" that there was virtual rioting in some towns in the Western provinces through eagerness to enlist; it is recorded that men walked hundreds of miles from the outposts of civilization to reach recruiting stations.

The Canadian government in the days of suspense preceding the war had kept fully in touch by cable with the European situation. When war was actually declared, an infantry division was offered to the mother country and accepted. The call for 20,000 men was answered with an enthusiasm never before witnessed in the Dominion. Within three weeks 33,000 men had assembled in the great new training camp at Valcartier, about fifteen miles from Quebec.

Canada's Military Effort. Early in the year 1914, Canada was practically without a regular army. There was a permanent force of about 3,000 men, partly to provide garrisons for the few Canadian fortresses and partly to train the militia. The latter was a lightly trained force of about 60,000 men, intended purely for defensive purposes on its own soil. At the end of September the first contingent of the Canadian Expeditionary Force (C.E.F.), after a month of intensive training, was sent across the Atlantic. The convoy of thirty-two ocean liners was the largest ever assembled in the history of the world; it carried 33,000 men, 7,000 horses and all the equipment necessary for an infantry division, a cavalry brigade, and the necessary reserves for the same. The convoy reached Plymouth safely, in spite of the efforts of enemy submarines, and was given a remarkable reception by the English people. The arrival of the Canadians proved the solidarity of the British people within the dominions of the king.

After three months of additional training in England, the first Canadian division landed in France on February 11, 1915. The second di-

vision was formed immediately, and it landed in France on September 14, and the Canadian Corps was then formed. The third Canadian division was formed in France early in 1916, and the fourth joined the Canadian Corps in mid-August, 1916. The Canadian cavalry brigade appeared in France in 1915. After the completion of the Canadian Corps of four divisions, the policy of the Dominion was to ensure a sufficient supply of drafts to maintain the corps at full strength.

Enlistments. From the beginning of the war to November 15, 1918, the total number of men enlisted in Canada was 595,441, of which 465,984 were obtained by voluntary enlistment, and 83,355 under conscription; 24,933 were granted leave or discharged. For British units distinct from the Canadian Expeditionary Force 21,160 men were raised. The number of men of the C.E.F. sent overseas was 418,052.

Casualties. The total casualties sustained by the C.E.F., reported to February 28, 1921, were 210,096. Of these 35,684 were killed in action, 15,000 died of wounds, 4,057 died of disease, 4,682 were presumed dead, 1 was still missing, and 3,569 died in Canada. There were 140,732 Canadian soldiers wounded, and 3,729 taken prisoners; thus there perished as the result of the war almost 60,000 Canadians.

Honors Granted to Members of the C.E.F. In all there were 26,340 British decorations given Canadian soldiers, of which 62 were the Victoria Cross, the most highly prized decoration in the Empire, while the others included the Distinguished Service Order, Military Cross, and Distinguished Conduct Medal. In all, 5,467 were mentioned in dispatches. There were also 1,150 foreign decorations granted to Canadian soldiers.

The Canadian Army Corps was commanded by Lieutenant General Sir Arthur Currie, with these divisional commanders: 1st Division, Major General A. C. MacDonnell; 2nd Division, Major General Sir H. E. Burstall; 3rd Division, Major General F. O. W. Loomis; 4th Division, Major General Sir D. Watson.

Finance. From the outbreak of war to November 30, 1918, Canada established credits on behalf of the Imperial government to the amount of \$709,000,000 to finance the purchase of foodstuffs and to carry on the operations of the Imperial Munitions Board in Canada.

Canadian chartered banks advanced to the Imperial government the sum of \$200,000,000 for the purchase of munitions and wheat. This was made possible by the large savings deposits in Canadian banks, which, from August, 1914, to October 31, 1918, despite the withdrawals for subscriptions to war loans, increased by \$417,115,476.

Great Britain made advances to the Dominion totaling \$600,000,000, chiefly for maintenance of Canadian troops overseas.

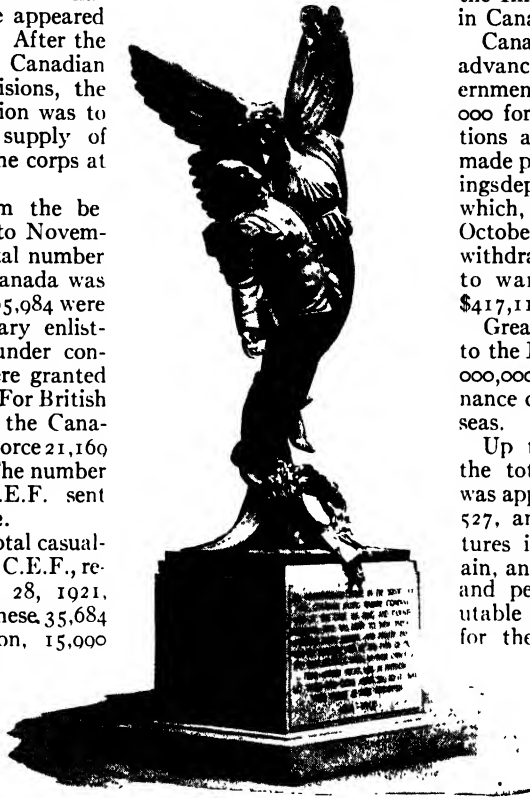
Up to November 30, 1918 the total outlay for the war was approximately \$1,068,606,527, and included all expenditures in Canada, Great Britain, and France. The interest and pension payments attributable to the war amounted for the entire war period to approximately \$76,000,000.

The net debt of Canada, which before the war stood at about \$336,000,000, passed the billion-dollar mark, and on November 30, 1918, amounted to

\$1,307,420,661. The increase was almost entirely attributable to war expenditures. Taxation on luxuries was gradually introduced after the beginning of the war, as it was justified by the financial condition of the country.

Munitions. The British War Office made inquiries as to the possibility of obtaining supplies of shells from Canada. As a result, the Minister of Militia, in September, 1914, appointed an honorary committee, known as the Shell Committee, to undertake the task of supplying shrapnel shell to the Imperial government.

Canada produced munitions of war to the value of \$1,002,672,413. It manufactured 65,343,647 shells; 11,297,107 lbs. of explosives; 107,000,000 lbs. of metals, as well as immense quantities of fuse parts, cartridge cases, airplane lumber, etc.



NOT FORGOTTEN

The Canadian Pacific Railway has erected statues like the above in its stations in Montreal, Winnipeg, and Vancouver in memory of employees who died in the war

Changes of Government. In 1919, Sir Robert Borden resigned the Premiership, and was succeeded by Arthur Meighen. In the same year, following the death of Sir Wilfrid Laurier, William Lyon Mackenzie King became leader of the Liberal party, and he was able to remain the dominant figure in Canadian politics for ten years. In 1921 a Conservative defeat in the Parliamentary election gave King the Premiership, but without a working majority of his party behind him. His government by compromise lasted until June, 1926, when his party was defeated in the House of Commons.

Upon Governor-General Byng's unexpected refusal of the Premier's request to dissolve Parliament, at the request of King, Meighen was called to form a Cabinet; but in the ensuing election King was returned to power.

King again appealed to the country in an election held in July, 1930, with the Dunning Budget and Empire trade as his platform. Reverses in the province of Quebec brought about the decisive defeat of the Liberal party, and the Conservative leader, Richard Bedford Bennett, became Premier at a critical juncture in the economic history of Canada.

Imperial Conference in London. The 1926 Imperial Conference was the most important of these meetings of leaders of the empire. A new status was given the great commonwealths, Canada, Newfoundland, Australia, New Zealand, South Africa, and the Irish Free State. The Conference placed the seal of approval upon their ambition for complete self-control. The dominions were made equal in power with the mother country. It made them free; it absolved them from all pretense and semblance of subordination one to another, yet they remain firmly cemented into one mighty sisterhood of states, the British Commonwealth of Nations. G.H.L.

Related Subjects. The following index will simplify reference to the many topics in these volumes which have to do, directly or indirectly, with Canada. The articles on the provinces have also detailed lists of related subjects.

CANALS

Sault Sainte Marie Welland

CITIES AND TOWNS

See lists under different provinces.

DISTRICTS

Assiniboia Labrador
Athabaska Mackenzie
Franklin Ungava
Klondike

GOVERNMENT

Cabinet Province
Governor-General Royal Canadian
Lieutenant-Governor Mounted Police
Parliament Territory
Premier

GULFS AND BAYS

Baffin Land and Hudson Bay
Baffin Bay James Bay
Belle Isle, Strait of Juan de Fuca, Strait of
Fundy, Bay of Puget Sound
Georgian Bay Saint Lawrence, Gulf of

HISTORY

Acadia	Northwest Passage
Aix-La-Chapelle,	Northwest Territories
Treaties of	Paris, Treaties of
British Empire and	Quebec, Battle of
Commonwealth of	Quebec Act
Nations	Red River Rebellion
British North America	Revolutionary War in
Act	America
Clayton-Bulwer Treaty	Rupert's Land
Dominion Day	Ryswick, Treaty of
Empire Day	Saskatchewan Rebellion
Flag	United Empire Loyalists
Fort Niagara	War of 1812
French and Indian Wars	Webster-Ashburton
Hudson's Bay Company	Treaty
Jay Treaty	World War
Louisburg (Sieges)	

The following is a list of those who, whether as soldiers, statesmen, or administrators, have had a part in the making of Canadian history. Their biographies appear in these volumes:

Aberdeen, John C	Lansdowne, Marquis of
Gordon, Earl of	La Salle, René de
Amherst, Baron	Laurier, Sir Wilfrid
Argyll, Ninth Duke of	Lisgar, Baron
Borden, Sir Robert L.	Macdonald, Sir John A.
Brock, Sir Isaac	Macdonald, John S.
Carleton, Sir Guy	Mackenzie, Alexander
Champlain, Samuel de	Marquette, Jacques
Connaught, H. R. H.,	Metcalfe, Baron
The Duke of	Ninto, Earl of
Derby, Earl of	Monck, Viscount
Devonshire, Duke of	Montcalm, Marquis de
Dufferin and Ava,	Monts, Sieur de
Marquis of	Mount Stephen, Baron
Durham, Earl of	Strathcona and Mount
Frontenac, Comte de	Royal, Baron
Grey, Earl	Sydenham, First Baron
Haldimand, Sir	Taché, Sir Etienne P.
Frederick	Thompson, Sir John
Joliet, Louis	Tupper, Sir Charles
King, William L. M.	Wolfe, James

ISLANDS

Anticosti	Queen Charlotte Islands
Cape Breton	Sable
Magdalen	Thousand Islands
Manitoulin	Vancouver

LAKES

Athabaska	Memphremagog
Champlain	Muskoka Lakes
Erie	Nipigon
Great Bear	Ontario
Great Lake	Rainy
Great Slave	Saint Clair
Huron	Superior
Lake of the Woods	Winnipeg
Manitoba	Winnipegosis

LEADING PRODUCTS

Alfalfa	Gold
Apple	Hay
Asbestos	Herring
Barley	Horse
Cattle	Iron
Coal	Lumber
Cod	Nickel
Copper	Oats
Corn	Potato
Fish	Rye
Flax	Salmon
Fruits	Silver
Fur	Wheat

MOUNTAINS

Assiniboine, Mount	Logan, Mount
Athabaska, Mount	Robson, Mount
Cascade Range	Rocky
Columbia	Saint Elias
Hooker, Mount	Selkirk
Laurentian Plateau	

OUTLINE AND QUESTIONS ON CANADA

Outline

I. Location and Size

- (1) Latitude
- (2) Longitude
- (3) Position as compared with European nations
- (4) Boundaries
- (5) Size
 - (a) East and west length, 2,700 miles
 - (b) Greatest north and south extent, 1,600 miles
 - (c) Actual area, 3,729,665 square miles
 - (d) Area compared with that of other countries
 - (e) Area of separate provinces

II. The People

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- (2) Proportion of urban and rural population
- (3) Density
- (4) Origins of the people
- (5) Religion
 - (a) Predominance of Roman Catholics
- (6) Education
 - (a) Provincial control
 - (b) "Separate schools"
 - (c) How expenses are met
 - (d) Adoption of modern theories
 - (e) Illiteracy statistics

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 2. Saint Lawrence Valley
 3. Acadian region
 4. Niagara escarpment
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 1. Prairie region
 2. First escarpment
 3. Missouri Coteau
 - (c) The western mountains
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 2. Coast ranges
 3. Outstanding peaks
- (2) Drainage
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 2. Those draining into Arctic Ocean
 3. Rivers of Pacific slope
 - (b) Lakes
- (3) Climate
 - (a) Conditions due to latitude

- (b) Variations due to surface and presence of large bodies of water
- (c) Average temperatures
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 2. Maritime provinces
 3. Saint Lawrence section
 4. Prairie provinces
 5. Western coast

IV. Plant and Animal Life

- (1) Plants
 - (a) Dependence on climate
 - (b) Plant regions
- (2) Animals
 - (a) Game animals
 - (b) Birds

V. Industries

- (1) Agriculture
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 3. Barley
 4. Rye
 5. Corn
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 2. Peaches
 3. Grapes
 4. Berries
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 2. Flax
 3. Hay
 4. Potatoes
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 - (e) Dairying and poultry-raising
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 2. Inshore fishing
 - (b) On the Pacific coast
 - (c) Fresh-water fisheries
 - (d) Value of annual catch
- (3) Mining
 - (a) Coal
 - (b) Gold
 - (c) Silver and lead
 - (d) Other minerals
 - (e) Effects of war on output
- (4) Manufacturing
 - (a) Natural location of districts
 - (b) Leading products

OUTLINE AND QUESTIONS ON CANADA—Continued

VI. Transportation and Commerce

- (1) Navigable rivers
- (2) Canals
- (3) Railroads
 - (a) Intercolonial Railway
 - (b) Canadian Pacific
 1. Part in development of the country
 - (c) Canadian Northern
 - (d) Grand Trunk Pacific
- (4) Foreign commerce
 - (a) With what countries
 - (b) Value of imports and exports

VII. Government

- (1) General character
 - (a) Resemblances to that of Great Britain
 - (b) Resemblances to that of United States
- (2) Departments
 - (a) Executive
 1. Governor-General
 2. The Ministry
 - (b) Legislative
 1. Senate
 - a. Membership
 - b. Powers

2. House of Commons
 - a. Membership
 - b. Powers
3. Officers of Parliament
- (c) Judicial
 1. Supreme Court
 2. Exchequer Court
 3. Admiralty Court
- (3) Provincial governments
- (4) Military system

VIII. History

- (1) Discovery and exploration
- (2) Colonization
- (3) Struggle for control
- (4) Opening of the West
- (5) Struggle for responsible government
- (6) Act of Union
- (7) Confederation
- (8) Period of expansion
 - (a) New provinces established
- (9) National problems
- (10) Recent development
- (11) Foreign relations
- (12) Canada and the World War
- (13) Later history

Questions

How many men did Canada send to the aid of England during the progress of the World War?

Would the shooting season for wild fowl be earlier or later in Western Canada than in Texas? Why?

What is the most valuable mineral product of the Dominion? In what mineral has Canada almost a monopoly?

How does the constitution of the Dominion resemble that of the United States? How does it differ from it?

Who was "the Father of New France"? What did he do to win the title?

Has the largest province the largest population? In which province are there the most people to the square mile?

How do the great interior plains of Canada differ from those of the United States?

What animal has been made the national emblem of Canada?

Where are the mineral-bearing regions located? What relation do those of the United States bear to them?

How are the public schools supported?

What was the first resource of this vast land which attracted the Frenchmen? The second?

What are *Metis*? What part did they play in the Red River Rebellion?

What peculiarity of surface is it which causes Niagara Falls?

Where are the forested regions of the Dominion?

What is meant by "separate schools"?

What were Cabot's two objects in making the voyage which resulted in the discovery of Labrador?

When did the idea of Confederation originate? When was it put into actual operation?

How large a water area is included in Canada?

OUTLINE AND QUESTIONS ON CANADA—Continued

How is the international boundary between Canada and the United States fortified?

Is Newfoundland a part of the Dominion?

Why is there so much rain on the Pacific coast and so little just over the mountains?

What are the Newfoundland "Banks"? What has been their importance in the development of the country?

What condition did British Columbia impose before it would consent to join the Dominion?

In what way do the legislative departments of Quebec and Nova Scotia differ from those of the other provinces?

What is meant by "responsible" government? How was it gained in Canada?

How many countries in the world are larger than the Dominion?

Which is the largest province? Has it always been so?

What effect did the Saint Lawrence have on the development of the country?

Why have the Maritime Provinces a warmer, more humid climate than regions in the same latitude farther west?

Mention several ways in which the government helps the farmer.

What is meant by the word *puisne*? How is it used in connection with the judicial system?

When were Upper and Lower Canada constituted? What was the difference in the character of their population?

What nation of Europe has about the same population as Canada?

What is the "height of land"? What effect does it have?

Why is the coast of Labrador colder than the western coast of the Dominion in the same latitude?

Name two great factors in the development of the West.

How does the Dominion rank among the countries of the world as regards railway mileage in proportion to population?

Where are Canada's coal areas?

When Canada came into the possession of England, what was the proportion of English to French inhabitants?

What part of Canada lies in the same latitude as London? As Paris? As Stockholm?

What effects did the great glacier have on the surface of Canada?

To what part of the country did Longfellow refer in his line, "In the *Acadian* land, on the shores of the Basin of Minas"?

Where is the most magnificent scenery to be found?

Name three canals that serve different parts of the country, and tell why each one is important.

How large a population has the part of Europe which in latitude corresponds to Canada?

What is there notable about the lock at Peterborough?

Is there much immigration from Canada to the United States? From the United States to Canada?

What important change has occurred in the Protestant churches of Canada?

Name the first five cities in the Dominion in respect to population.

Is the famous Klondike gold field in Canada or in the United States?

Does Canada send a diplomatic representative to the United States?

What falls, second only to Niagara in the Dominion, are in one of the Prairie provinces? How high is the larger?

Are there any Mormons in Canada?

Who is the Governor-General of the Dominion? What is his place in the government? Have his duties recently been modified?

POLITICAL DIVISIONS

Alberta	Nova Scotia
British Columbia	Ontario
Manitoba	Prince Edward Island
Maritime Provinces	Quebec
New Brunswick	Saskatchewan
Northwest Territories	Yukon

RIVERS

Assiniboine	Nelson
Athabaska	Ottawa
Chaudière	Peace
Churchill	Red River of the North
Columbia	Saguenay
Fraser	Saint Lawrence
Mackenzie	Saskatchewan
Miramichi	Skeena
Montmorency	Stikine
Moose	Yukon

CANADA, UNITED CHURCH OF. In June, 1925, when the Congregational, the Methodist, and the Presbyterian churches of Canada united under this name, the act marked the culmination of a movement which had been progressing for more than twenty years.

The growth of the movement had been gradual, beginning in 1899, when the union of Protestant churches was suggested as a remedy for the overlapping of Protestant missions in Western Canada. In 1912 a vote among the church members on the matter of organic union resulted in the expressed approval of the Congregationalists and Methodists. The Presbyterian vote was not sufficient to warrant approval.

Three years later, the proposal for union was again submitted to the Presbyterian members, with a resulting majority in its favor; however, in 1916, the General Assembly of that Church agreed to take no action until two years after the World War.

The governing bodies of the three churches submitted the Church Union bill to the Canadian Parliament, and in 1924 the United Church of Canada Act was passed, to become effective in 1925.

The act of union sets forth the universal doctrinal points, continues the organization of churches already existing, and outlines the organization of those to be formed in the future. For six months after the passage of the bill, any church was privileged to vote against organic union, and by such vote to remain independent of the United Church. In this United Church of Canada there are about 700,000 communicants, in approximately 9,000 congregations.

CANADA BALSAM, *bawl' sam*, a resinous substance obtained from the balsam fir (see FIR), common in Canada and the United States. In odor it resembles turpentine, and it has a bitter taste. Formerly, it was used in medicine, but now is employed for other purposes. It enters into the manufacture of varnishes, is used for mounting objects on glass in microscopic work, and is utilized in

photography and as a cement for joining the parts of optical instruments. Canada balsam has perfect transparency and possesses the power of refracting light, qualities that make it very valuable to the optician.

CANADA GOOSE, the common wild goose of the North American continent, which nests in the region stretching from the northern limit of tree growth in the lower Yukon Valley as far south as Indiana. No member of its race has more interesting migratory habits than this bird of passage. When autumn heralds

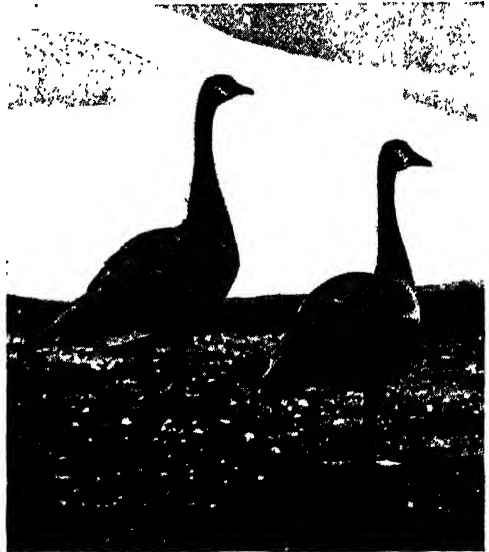


Photo U. S. U.

CANADIAN WILD GEESSE

the approach of winter, vast numbers from the fur-bearing sections of Canada assemble along the shores of Hudson Bay, and as the increasing cold drives them to seek a sunnier home, great flocks arranged in long, converging lines, with an old gander at the head, begin their southward flight.

These living wedges of feathered travelers fly high in the air, the loud, hoarse "honk" of the leader and the answering calls of his followers often being the only sounds that break the silence of the solitary regions through which they pass. Early in October they reach the coasts of the Eastern and Middle states, and through the winter they are found in various warmer parts of the Union, even to the most southern portion of Florida. Their food is chiefly grass and berries, but they also devour small water animals and grain.

The Canada goose is about thirty-six inches long and wears a grayish-brown coat. The head, neck, and tail are black, the under parts gray, and there is a broad, white patch on the throat. The nest, which is usually placed on the ground, but occasionally on trees, is made

loosely of twigs and grass, and holds from five to seven pale-green or buff-white eggs. As this bird is much sought by hunters, because of the delicacy of its flesh, it is included in the list of game birds which are protected by law during the greater part of the year. The Canada goose has been introduced into Europe. These geese are easily tamed, if the eggs are hatched by a hen or domestic goose, and they will interbreed with tame geese. Canada geese are wary and intelligent birds, and reach an age of twenty years or over D. L.

Scientific Name. The Canada goose belongs to the family *Anatidae*. Its scientific name is *Branta canadensis*.

CANADA THISTLE, a variety of thistle that, more than all others of its family, deserves the name of pest, for it is one of the most troublesome weeds in existence. A native of Europe, it reached Canada and the United States through the mingling of its seed with imported grains, and now grows in wild profusion throughout the northern half of the United States and the southern part of Canada. Nature has given it the best possible weapons with which to maintain a successful battle for its existence against its enemy, man. Within the tubes of its small purplish flowers is hidden a sweet nectar, which attracts countless bees and butterflies, wasps, flies, and beetles. The pollen grains have a slight stickiness and are carried away with the greatest ease on the

hairs of the insects, to be later deposited on the stigma of another flower. The plant also is well adapted to fertilization by means of its seeds and its horizontal rootstocks, every portion of which can produce a new plant.

For this reason, partial uprooting may work harm, for several plants may spring up where only one grew before.

Since the roots are kept alive with food supplied by the leaves, it is possible to starve them out by cutting down the green stems as fast as they appear. This may be done as a part of the cultivation of corn or other crop that is planted in rows. Planting such a crop in a thistle-infested field and persisting in the process for one or two seasons will usually destroy the weeds. See THISTLE: SEEDS (Dispersal). B.M.D.



Photo. Saint Clair

CANADA THISTLE

Scientific Name. The Canada thistle belongs to the composite family, *Compositae*. Its botanical name is *Cirsium arvense*.

CANADIAN AGRICULTURAL COLLEGES. See AGRICULTURAL EDUCATION (In Canada).

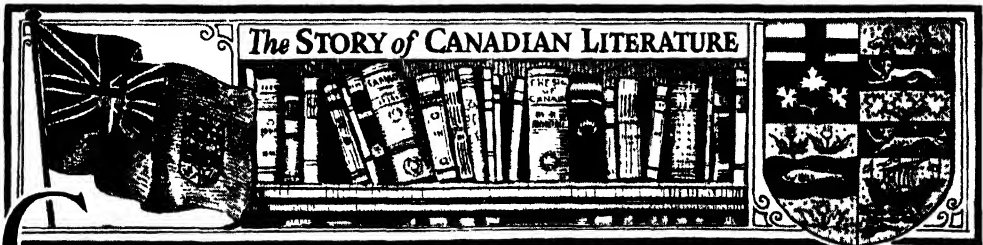
CANADIAN AND BRITISH COURTS. See COURTS, CANADIAN AND BRITISH.

CANADIAN ARMY, in the World War. See CANADA, page 1144.

CANADIAN CABINET. See CANADA (Government).

CANADIAN COÖPERATIVE WHEAT PRODUCERS. See COÖPERATION.

CANADIAN DEBT. See NATIONAL DEBT.



CANADIAN LITERATURE. The literature of Canada springs from two great roots which can never form a single tree. Each root, however, has already brought forth a sturdy sapling which is making room for itself among the literatures of the world. So long as French is spoken in Canada, the French-Canadians will have a literature which not only records

their own achievements and voices their own aspirations, but also shows the influence of France. The highest honor which can be awarded to the work of a French-Canadian author is the laurel crown of the French Academy.

The Canadian who writes in English is less dependent on the traditions of the mother

country. It is true, he has the splendid heritage of all English literature, but he also has a separate history which encourages independence. British rule has turned the literary eye of French Canada back to France itself, but it has given English Canada a new national consciousness which is reflected in its literature.

French Canada. The literature of French Canada divides itself naturally into two periods, the year 1763 being the dividing line. The books written before that year were the work of explorers and missionaries, and naturally deal with discovery and travel. The men who first attempted to plant European civilization on American soil wrote vivid accounts of their struggles. The chronicles of Cartier's voyages, the narratives of Champlain and Hennepin, the histories of Lescarbot, Sagard, Le Clerq, and Charlevoix form a body of literature of the highest rank. The volumes of the *Jesuit Relations*, which contain the reports of the missionaries, must not be omitted from this group.

Totally different in character, but equally important, were the Breton and Norman folk-songs, which, in the course of time, acquired some of the spirit of their new homes. They were once transmitted orally from generation to generation, and it is only in recent times that some of them have been put into print. To this day, they recall the France of two or three centuries ago, when the Quebec habitant and the French peasant led lives of much the same character.

Patriotism and Histories. The beginning of British rule over French Canada in 1763 caused a struggle between two civilizations which has not yet entirely disappeared, and created a new type of French-Canadian literature which is distinguished chiefly by race-patriotism. Its first important products were the speeches of Louis J. Papineau. These speeches, purely political in purpose, rank first, in comparison with written works, both in popular esteem and in point of time. Soon thereafter appeared the histories of Canada by Michel Bibaud and François X. Garneau, the latter still regarded by the French as their standard authority. Garneau's work has considerable distinction of style and has had a great influence, but it is marred by an excessive patriotism which prevents it from being authoritative. It remains valuable, however, as "the first great literary stimulus to racial self-respect."

Of later historians, there is a long list, beginning with Benjamin Sulte, Abbé Casgrain, and Sir James Le Moine. Others whose names are well known for their works on historical or economic subjects are Thomas Chapais, Etienne Parent, Laurent David, and Alfred D. De Celles. Among journalists and publicists must be mentioned Henri Bourassa, also famous as an orator, Joseph Charles Taché, Hector Fabre, and Abbé J. A. Damours.

Poetry. In the poetry of French Canada, the patriotic note is dominant. When the keynote is not love of Canada, it is love of the great Mother Church. This is especially true of the earlier poets. Among the modernists, a breaking away from patriotic and

ecclesiastical subjects is noted, but the bulk of French-Canadian poetry is woven about striking incidents in French-Canadian history or legend.

Octave Crémazie (1827-1879), the first distinct Canadian poet, is often known as the national poet of French Canada, because of the fervid patriotism which marked his poems. His *Le Drapeau de Corillon*, a dirge of a lost cause, is one of the best loved songs of French Canada, and his beautiful description of the Thousand Islands has seldom been surpassed.

Following Crémazie came Leon Le May (1837-1918), whose poetry is marked by strict orthodoxy, morality, and devotion to Canada. Perhaps his most significant work is a translation of Longfellow's *Evangeline*, although *Les Gouttelettes*, a collection of 175 sonnets on Biblical and religious subjects, has received enthusiastic praise.

The most distinguished of French-Canadian poets is Louis Honoré Fréchette (1830-1908), whose work was crowned by the French Academy in 1884. His chief work in verse is *La Légende d'un Peuple*, an epic of the French in Canada.

Of the minor poets belonging to this period, the most important are Alfred Garneau, a son of the historian, William Chapman, who was intensely French, in spite of his English name; and Benjamin Sulte, who is better known as an historian.

The modern school of French-Canadian poetry had its birth in Montreal. Its three most distinguished representatives are Émile Nelligan, Albert Lozeau, and Paul Morin. The poetry of Morin, who is a scholar and a traveler, is of special significance, and is distinguished from the poetry of the earlier school by its breadth of outlook.

Fiction. French-Canadian fiction is quite as nationalistic as its verse. The first novel of importance is *Les Anciens Canadiens*, by Philippe de Gaspé, a rambling tale with a commonplace plot, but valuable as a faithful picture of the ancient régime. *Jean Rivard*, by Antoine Gerin Lajoie, is the French-Canadian adaptation of the cry, "Back to the land." Other novels of the earlier period are *Charles Guérin*, by Pierre J. O. Chauveau, *Claude Paysan*, by Ernest Choquette, and the historical novels of Joseph Marquette, of which *L'Intendant Bigot* and *Eve et Charles* are probably the best known.

During recent years, Mme. Laura Conans has won distinction with her novel *L'Oublie*, and Judge Adolphe Routhier has written an historical novel, *The Centurion*, which portrays Jewish and Roman history in the time of Christ.

But the most celebrated novel of French Canada was written by a Frenchman, Louis Hémon, who spent a few years in Quebec and studied its people. *Maria Chapdelaine*, which has been translated into several languages, and whose sale has exceeded 900,000 copies, is a classic of the soil and depicts the courageous, simple-hearted Canadian pioneer in a sympathetic and masterly fashion.

English Canada. The literature of English-speaking Canada begins at a later date but with a character similar to that of French Canada. The first writers were men like Samuel Hearne, Sir Alexander Mackenzie, and Alexander Henry, who wrote accounts of their own travels and discoveries. This period of exploration coincided roughly with the rapid settlement and development of New Brunswick and Upper Canada (Ontario) by the United

Empire Loyalists. For a generation or two, these settlers were too busy to write books, and it was not until about 1830 that English Canada paid much attention to literature.

The struggle for responsible government, both before and after the Union of 1841, was accompanied by a flood of controversial political literature, much of which is now of little value. The speeches and writings of Bishop Strachan, Sir John Beverly Robinson, William Lyon Mackenzie, Egerton Ryerson, and Joseph Howe, however, are brilliant pieces of work as literature, regardless of the great influence they had on the events of the day.

The chief literary figure of this period is Thomas Chandler Haliburton, who wrote under the pen name of "Sam Slick." Haliburton in private life was a distinguished lawyer and judge, but to posterity he is still the first Canadian humorist. One of his distinctive gifts was his aptitude for short, pithy sayings. "Circumstances alter cases" is perhaps the best-known quotation from his books.

Influence of Political Life. With the coming of Confederation there was a distinct growth of literary activity in the Dominion. A Canadian national spirit then first asserted itself, and perhaps for the first time there were signs of a truly national literature. Just pride in home and native land and the appreciation of the pioneers' sacrifices inspired the poet as well as the novelist and the historian. The speeches which had for their purpose the arousing of a spirit of unity still remain as a distinct type of literature, and many of the later speeches of Sir Charles Tupper, Sir John A. Macdonald, Alexander Mackenzie, Sir Alexander T. Galt, Edward Blake, and Sir Wilfrid Laurier have an enduring quality which makes them good literature.

Fiction. Until recent years, Canadian novelists were exceedingly few in number. In the fields of history and poetry, Canada was as well represented as are most young nations, but it has been only within the last twenty years that Canadian fiction has come into the forefront.

The first Canadian novelist of importance was Major John Richardson, who wrote, in 1832, *Wacousta, a Tale of Pontiac's Conspiracy*. In 1836 Judge Haliburton published his famous humorous novel, *The Clockmaker, or the Sayings and Doings of Sam Slick*, and within a few years several other humorous works by him appeared, notably *The Old Judge*, which portrays life in Nova Scotia. James De Mille's first novel was published in 1865, and a score or more followed, of which the best is undoubtedly *A Strange Manuscript Found in a Copper Cylinder*. After Confederation, the first novel of consequence was William Kirby's *Golden Dog*, a lengthy narrative based on a legend of Quebec. From that period until the fruitful period ushered in by the '90s, no novels were forthcoming.

In 1890 Sara Jeannette Duncan published her first book, *A Social Departure, or, How Orthodoxy and I*

Went 'Round the World by Ourselves, which has been pronounced "the wittiest book of travels ever written by a Canadian." Miss Duncan married Everard Cotes, a Calcutta journalist, and from that period until her death her books have Indian settings chiefly. In *The Imperialist*, the only one of her many novels which deals with Canada, she has caught the Canadian atmosphere remarkably well.

Gilbert Parker's early work began to appear in 1892, and soon sprang into popularity. He, too, left his native land in his early manhood, and the settings of his later novels are outside of Canada. *The Seats of the Mighty*, which deals with French rule in Canada just prior to the English conquest, is conceded to be his finest work.

In 1897 *Black Rock* appeared, and its author, Rev. C. W. Gordon, better known by his pseudonym, "Ralph Connor," has since then enjoyed a popularity which is unique among Canadians. *The Sky Pilot*, a novel of the same type as its predecessor, followed his first venture, and almost all of his later novels deal with some phase of life in the Canadian West. *The Foreigner* opens up the problem of miscellaneous European immigration, and is significant for this reason, but none of the later novels are as spontaneous or as original as the earlier books.

With the advent of the twentieth century, fiction in Canada came into its own, and the first four years of the second decade ushered in a number of new writers. The themes of these present-day novelists are varied, and in some cases it is difficult to classify them according to the character of their work. Hopkins Moorhouse and Murray Gibbon belong to writers of this type. Basil King, who has a large following on the American continent, was another novelist with a versatility of theme, but with an increasing tendency toward the sociological novel. The West is still a popular subject with novelists, and is the main theme of writers like Frederick Niven, Robert Stead, Bertrand Sinclair, "Luke Allan," Douglas Durkin, and Robert Watson. Arthur Stringer has written a trilogy of novels on prairie life, but most of his novels are detective stories. Frank Packard and Victor Lauriston are also writers of mystery stories. The animal story is a favorite with such writers as Charles G. D. Roberts, Ernest Thompson Seton, Marshall Saunders, and W. A. Fraser. "Canadianization" is the theme of two recent novels, *Hansen*, by Augustus Bridle, and *Redemption*, by Beckles Willson. Stephen Leacock stands alone as an exponent of humor in Canada. He is a prolific writer, and shows the serious side of his nature in his writings on history and political economy, but it is for his humorous writings that he is chiefly known, and of these none of his later works surpass his *Sunshine Sketches of a Little Town* and his *Literary Lapses*.

A number of women novelists have sprung into prominence during recent years, among whom L. M. Montgomery, the author of *Anne of Green Gables*, is perhaps the best known. Mark Twain said of her heroine "Anne" that "she was the most moving and delightful child of fiction since the immortal Alice." "Marian Keith" writes of life in rural communities or small villages of Ontario. Isabella Ecclestone MacKay usually chooses small town romances as her theme, but unlike the novels of "Marian Keith," her novels give more attention to situations than to character drawing.

Among the more recent women writers are J. G. Sims, author of *Our Little Life*, an appealing picture

of the lives of the poor in a large city; Laura Salverson, author of *The Viking Heart*, a powerful portrayal of Icelanders in Western Canada; Winnifred Eaton Reeve, better known by her pseudonym, "Onoto Watanna," who has been known for a number of years as a writer of romantic tales with Japanese settings, but who has recently written a realistic novel of ranch life called *Cattle*, Mazo de la Roche, who in *Possession* portrays life on a Niagara fruit farm; her *Jalna* in 1927 won a \$10,000 prize; Marjorie Pitchall, who wrote *The Bridge*, a story of the Great Lakes, and a collection of whose short stories, *Angels' Shoes*, was published after her death, Mrs. L. Adams Beck, whose stories have Oriental settings and are imbued with the philosophy of the East, and who, under the pseudonym of E. Barrington, recreates women once famous in English history, such as Lady Hamilton in *The Divine Lady*, and Isabel Paterson, whose *Singing Season* is a brilliant historical novel of Spain.

Many of the newer writers show promise in their work, but up to date the "great Canadian novel" has been written by the Frenchman, Louis Hémon. Since, however, two excellent translations of *Maria Chapdelaine* have been made by Canadian authors, it may be fittingly classed with English-Canadian fiction. The translation by W. H. Blake, the late scholar and essayist, is worthy of special mention, and is regarded as a literary masterpiece.

History and Biography. The formal histories, with the exception of the works of Francis Parkman, who was not a Canadian, do not rise to great heights. The standard history of Canada is by William Kingsford, it is an accurate record, but has little charm of style. The two most interesting of the briefer histories are George Bryce's *Short History of Canada* and Charles G. D. Roberts' *Short History of the Canadian People*.

The history of the Northwest has been treated by a number of writers. The best works on the subject are Lawrence Burpee's *The Search for the Western Sea*, George Bryce's *Remarkable History of the Hudson's Bay Company*, his *Romantic Settlement of Lord Selkirk's Colonists*, and Beckles Willson's *The Great Company*. Agnes Laut has written a number of books on the Northwest in a vivid, informal style.

Arthur G. Doughty, Oscar D. Skelton, William Bennett Munro, and William Wood have dealt with special features in Canadian history, and William P. M. Kennedy has written an authoritative study of the Canadian Constitution which has replaced Sir John G. Bourinot's earlier books on the subject.

But the most intensive studies of Canadian history are to be found in three series of biographical and historical narratives. Of these, the most important is the *Makers of Canada*, a series of biographies showing the part which Canadian explorers, statesmen, and soldiers have played in the development of the Canadian nation. It consists of twenty-one volumes, written by various Canadian authors. *Chronicles of Canada*, a set of thirty-two volumes dealing with different aspects of Canadian history, written in a popular style, is under the editorship of George M. Wrong and H. H. Langton, and is an interesting contribution to Canadian history. The third series, called *Canada and Its Provinces*, consists of twenty-four volumes, edited by Adam Shortt and Arthur G. Doughty, which give a review of Canadian history and a summary of the various phases of Canadian life and achievement. The Champlain Society was organized in 1905 by a number of Canadian scholars

interested in historical research in connection with Canadian history. Already sixteen volumes have been published by the society, and they have proved of decided value in illuminating early Canadian history.

Poetry. The earliest Canadian poetry of much importance is the work of Charles Sangster (1822-1893), who drew his inspiration mainly from Canadian scenery and history. His best-known poem is *The Rapid*. Charles Mair owes his distinction to his poetic drama *Tecumseh*, which is noteworthy for its insight into Indian character and for its striking descriptive passages. Isabella Valancy Crawford (1850-1887) lived and died in obscurity, but her poems have since become the subject of warm praise from reputable critics. *Old Spookes' Pass*, a narrative poem in dialect, and *Malcolm's Katie*, a long poem in blank verse with occasional lyrics interspersed, are her two most important works.

Archibald Lampman wrote nature poetry, marked by strong originality and fine sensibility. Of his first volume of poems, *Among the Millet*, W. D. Howells wrote: "Every page has some charm of phrase, some exquisite divination of beauty, some happily suggested truth." His sonnet, *The Frogs*, shows his ability to transform commonplace subjects:

Then like high flutes in silvery interchange
Ye piped with voices still, and sweet and strange,
And ever as ye piped on every tree
The great buds swelled, among the pensive woods
The spirits of first flowers awoke and flung
From buried faces the close-fitting hoods
And listened to your piping till they fell,
The frail spring-beauty with her perfumed bell,
The windflower, and the spotted adder-tongue.

Charles G. D. Roberts is one of the most prolific of Canadian authors. His fame today rests largely on his animal stories, but as a poet he is worthy to stand beside his contemporaries. His *Songs of the Common Day*, a sonnet sequence which follows the farmer's seasonal activities, is his finest work in poetry.

Bliss Carman, who is a cousin of Roberts, is generally regarded as Canada's finest lyric poet. His first volume of poetry, *Low Tide on Grand Pré*, is his best. For sheer melody and pictorial beauty, his poems have seldom been surpassed.

William Wilfrid Campbell derives his inspiration from the regions around the Great Lakes. He is an objective nature painter, but has also written several dramatic monologues on historical subjects, and a vein of patriotism runs through his poetry.

Duncan Campbell Scott is another nature-painter, but with him the intellect is dominant, and his lyrics, with all their color and melody, are not as spontaneous as are the poems of his contemporaries. He is interested also in historical subjects, and in the interpretation of Canadian life and ideals.

Pauline Johnson, the Indian poetess, is the interpreter of the spirit of her people. Her work abounds in dramatic quality, and she is a lyrical of no small note. There is more passion in her poetry than in that of any other Canadian poet, and it is also more human. *The Cattle Thief* and *Red Men Die* are two of her most dramatic poems, and *The Song My Paddle Sings*, a stanza from which is quoted below, is conceded to be her lyrical masterpiece:

August is laughing across the sky,
Laughing while paddle, canoe, and I,
Drift, drift,

OUTLINE ON CANADIAN LITERATURE

I. FRENCH-CANADIAN LITERATURE

Explorers and Missionaries and Their Chief Works

- Jacques Cartier. 1494-1557
Bref Récit de la Navigation de Canada
 Samuel Champlain. 1567-1635
Des Sauvages: ou Voyage de Samuel Champlain
 Marc Lescarbot. 1570-1630
Histoire de Nouvelle France
 Louis Hennepin. 1640-1706
Description de la Louisiane
 Pierre Charlevoix. 1682-1761
Histoire de la Nouvelle France
 "The Jesuit Relations"

Historians and Their Chief Works

- François H. Garneau. 1809-1866
Histoire du Canada (Revised edition by Hector Garneau)
 Sir James M. Le Moine. 1825-1912
Chronicles of the St. Lawrence
Quebec Past and Present
 Henri R. Casgrain. 1831-1904
Pèlerinage au Pays d'Évangéline
 Benjamin Sulte. 1841-1923
Histoire des Canadiens-Français
 Henri Bourassa. 1868-
The French Canadian in the British Empire

Poets and Their Chief Works

- Octave Crémazie. 1827-1870
Poésies
 Alfred Garneau. 1836-1904
Poésies
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 Vilhjálmur Stefánsson. 1879-
The Friendly Arctic

Where the hillsuplift
On either side of the current swift

Frederick George Scott is a poet with a message—the consolation of the human spirit. Even his nature poetry has a religious and moral flavor that is lacking in the poetry of his contemporaries. Robert Norwood is another poet in whom the religious note is dominant. He has written a number of religious dramas, of which *The Man of Kerioth* is probably the most significant.

Marjorie Pickthall is a lyrical poetess who was cut off in the flower of life. Her poetry reveals rare delicacy, harmony, and color, and has an inner spiritual meaning as well. Her entire poetical output is contained in a small volume entitled *The Lamp of Poor Souls*, of which every word is pure poetry. A simple little poem *Serenade*, quoted below, will show the lyrical quality of her work

Dark is the iris meadow,
Dark is the ivory tower,
And lightly the young moth's shadow
Sleeps on the passion-flower.

Gone are our day's red roses,
So lovely and lost and few,
But the first star uncloses
A silver bud in the blue

Night, and a flame in the embers
Where the seal of the years was set,
When the almond-bough remembers,
How shall my heart forget?

John McCrae was a soldier poet who was killed in the World War. He left only a slender volume of verse, but his *In Flanders Fields* is perhaps the most famous single poem produced during the war. See his biography in these volumes, in it the poem appears.

Robert W. Service (born 1876) is a popular poet who writes of the wild life of the Yukon among the gamblers and miners, in a manner frankly imitative of Kipling's barrack-room balladry. *The Law of the Yukon* is one of his best-known poems

This is the law of the Yukon, and ever she makes it plain.
Send not your foolish and feeble, send me your strong
and your sane
Strong for the red rage of battle, sane, for I harry
them sore,
Send me men girt for the combat, men who are girt
to the core,

Swift as the panther in triumph, fierce as the bear in
defeat,
Sired of a bull dog parent, steeled in the furnace of
heat.

Unique among Canadian verse is the poetry of William Henry Drummond, who has immortalized the French-Canadian habitant in poetry, written in a quaint French-English dialect. The various episodes which make up the simple lives of this childlike people form the subjects of Drummond's poetry. One of his most popular poems is *Little Bateese*, which begins:

You bad leetle boy, not moche you care
How busy you're kipin' your poor gran'pere
Trying to stop you ev'ry day
Chasin' de hen aroun' de hay—
W'y don't you geev' dem a chance to lay?
Leetle Bateesel

Besides the major poets mentioned, there are a number of minor poets, among whom may be classed Arthur S. Bourinot, Wilson MacDonald, Ethelwyn Wetherald, Norah Holland, Florence Randal Linesay, Jean Blewett, Louise Morey Bowman, Isabella Ecclestone MacKay, Beatrice Redpath, Marian Osborne, and Tom McInnes. For the most part, these poets deal with the portrayal of various aspects of nature, although occasionally they deal with religious and historical subjects and the incidents of everyday life. G.H.L.

CANADIAN NATIONAL RAILWAYS. See CANADA (Railroads).

CANADIAN PACIFIC RAILWAY. See CANADA (Railroads).

CANADIAN RECLAMATION SERVICE. See PHOTOGRAPHY (Aerial Photography).

CANADIAN RIVER, the most important tributary of the Arkansas River. Rising in the northeastern part of New Mexico, it flows easterly through the "Panhandle" of Texas and Oklahoma for about 900 miles. The quantity of water it carries varies greatly at different seasons; sometimes it is almost dry; at other times it cannot be forded at all, and is not dependable for navigation. It enters the Arkansas in Eastern Oklahoma. See OKLAHOMA (Rivers and Lakes).

CANADIAN RUGBY. See FOOTBALL, subtitle.



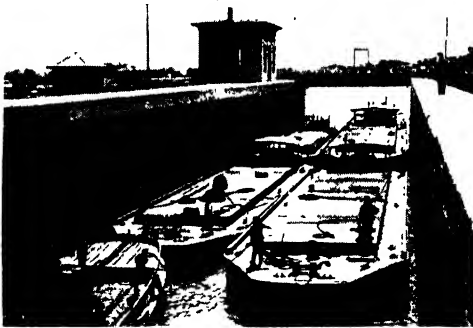
CANAL. As water highways for the transportation of people and their possessions, and as channels excavated for purposes of drainage and irrigation, canals have always played an important part in the progress of

mankind. The first artificial watercourses were probably irrigation ditches, but the many obstructions to travel in navigable rivers, and the delays and dangers experienced in journeying over rough trails and roadways and across

deserts and mountains by means of animal power, led to the building of canals for navigation many hundreds of years before railroads and airships solved the problem of rapid transportation.

[This article discusses only the canal for navigation. Drainage and irrigation channels are described under the headings DRAINAGE and IRRIGATION. The Chicago Drainage Canal (see CHICAGO DRAINAGE CANAL) is an important example of a channel excavated for the purpose of carrying away the sewage of a city.]

In Egypt, Assyria, India, and China, navigation canals were in operation long before the Christian Era. Nebuchadnezzar, the great Babylonian ruler of the sixth century B.C., restored a canal that classic writers say was originally built eleven centuries before his time.



NEW YORK STATE BARGE CANAL
Lock 28A, near Lyons.

This was the royal canal of Babylon, connecting the Tigris and the Euphrates rivers. It is an interesting tradition that a predecessor of the present Suez Canal (which see), joining the Nile River to the Red Sea, was begun about 600 B.C. by an Egyptian king; this is said to have been destroyed in A.D. 767 by a Mohammedan caliph. In the thirteenth century the Chinese constructed the most important work of its kind after the beginning of the Christian Era—the Grand Canal, connecting the Yangtze and the Pei-ho. This canal is 650 miles long and from five to six feet deep.

In comparison, canal-building in Europe developed somewhat tardily, the present magnificent systems dating from about the twelfth century. The invention of the canal lock, however, in 1481, the honor of which is claimed both by Italy and Holland, gave new impetus to the construction of artificial watercourses, and Europe has a canal mileage at the present time of about 13,300. The total for the world is about 26,000 miles, representing an expenditure of over two billion dollars, and over half of this is in a few countries of Europe.

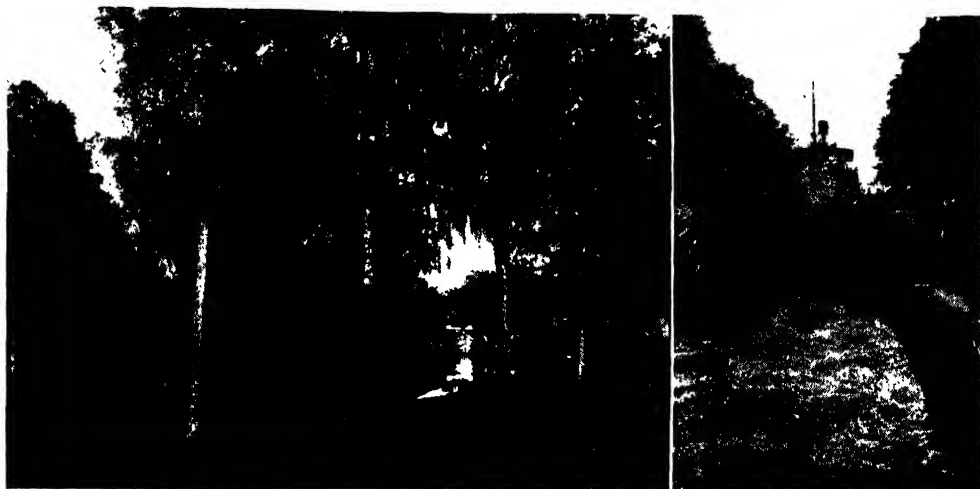
Details of Construction. In railroad-building, the track may run up or down grade, but

the course of a canal must consist of one or more level sections, or *reaches*. The Cape Cod Canal, which cuts through a narrow strip of land where the Cape and the Massachusetts mainland join, is an example of a waterway which connects two points on a single water level. Canals built over a route of different levels, like the Erie, consist of several reaches, the adjoining extremities of which are usually connected by locks. A lock is a chamber with stone or concrete side walls and water-tight gates at each end. In passing from a lower to a higher level, a vessel goes through the gates at the lower end, and floats into the chamber. The lower gates are then closed and the valves in the sides or bottom of the lock are opened, allowing the water from the higher level to flow in. When the water in the lock has reached the level of that above the upper gates, these gates are opened and the boat continues its journey.

The dimensions of a canal are determined by the size of the vessels which are expected to use it. It must be wide enough at the surface and bottom to permit any two boats to pass each other safely, and the depth should be at least one and one-half feet greater than the draft of the largest vessels that navigate it. The canal bed is always made flat. When the channel is excavated through soft earth, the sides slope outward from the bottom; the harder the material the steeper may be the banks. It is customary to cut the banks perpendicular, or nearly so, when the canal runs through rocks.

Embankments or aqueducts are built to carry canals across valleys; culverts are provided to carry streams beneath them; and these waterways are crossed by bridges wherever they are intercepted by ordinary traffic routes. The aqueduct usually takes the form of a masonry-arch bridge, the top of which is made into a channel or trough to conduct the water. Steel is now used to some extent in constructing these troughs.

Canals of the United States. The advantages that would result from building canals in a new and sparsely settled country were foreseen by George Washington and other statesmen of the early national period. A canal around the rapids of the Connecticut River, at South Hadley, Mass., the first artificial waterway built in America, was completed in 1793, but the first important work of this kind was the Erie Canal, across New York state, begun in 1817, now a part of the New York State Barge Canal. Its completion in 1825 was a significant event in the economic history of the country; it made a city of the town of Buffalo, at its western terminus, was largely responsible for the early commercial supremacy of New York City, and it gave a mighty impetus to settlement of what was then the West.



Photos. O. R. O. C.

TWO VIEWS ON CANALS IN SWEDEN

Beautiful scenery near Forsvik, where the canal reaches its highest elevation, about 275 feet above the sea. The steamer is passing an opened bridge. At right, a steamer at one of the five locks on the Göta Canal at Borenshtult.

The enlargement of the New York waterways, which necessitated an expenditure of over \$150,000,000, represents a revival of interest in canal-building. During the era of railroad expansion following the War of Secession, public interest in artificial waterways suffered a decline. Nearly all of the important canals in the country were opened before the war. Among these are the Chesapeake and Ohio, between Washington and Cumberland, Md. (1850); the Illinois and Michigan, between Chicago and La Salle, Ill. (1848); and the system of locks about the rapids of the Saint Mary's River, known as the Sault Sainte Marie Canal (1855). The Hennepin, or Illinois and Mississippi, Canal, extending from the Illinois River near Hennepin to the Mississippi near Rock Island, was begun in 1892 and completed in 1908, but it was almost the only boat canal started during the period between the close of the war and the beginning of the twentieth century.

There have been constructed a fourth great lock on the Sault Sainte Marie Canal and a ship canal across Cape Cod, connecting Buzzard's and Barnstable bays; these projects were completed in 1914 and 1919, respectively. The latter was financed by a private corporation, but passed into Federal control by purchase in 1928. This fourth lock at Sault Sainte Marie is the largest in the world, 1,350 feet long between gates, 80 feet wide, and 24.5 feet deep.

Other projects completed within a decade were the Lake Washington Canal, extending from Puget Sound to Lake Washington; and the Dalles-Celilo Canal, around the Dalles Rapids, which opens the Columbia River to

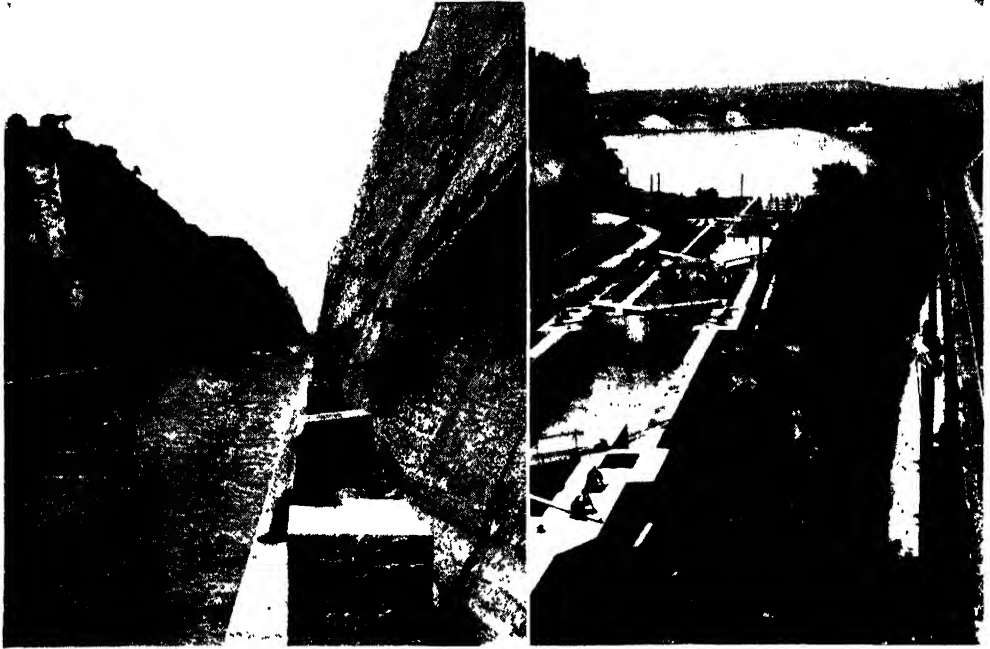
light-draft boats up stream as far as Priest Rapids, and to Lewiston, on the Snake River, in Idaho. Work was completed on the Ohio River project in 1929; this now provides a navigable waterway from Pittsburgh to Cairo, Ill.; it enables vessels to pass the river's shoals and rapids. Extensive improvements have also been made on the Louisville and Portland Canal around the falls of the Ohio. In 1917 all sections of the New York Barge Canal were ready for service, so the first three decades of the twentieth century have a very creditable record in the matter of canal-building.

To the United States also is due the honor of completing a project that has held the interest of the nations for centuries—the great cut across the isthmus that joins the two American continents. The Panama Canal, opened the same year as the Cape Cod Canal and the third Davis lock at Sault Ste. Marie, is accessible to all countries on an equal basis, and has influenced the economic history of the entire world.

About 4,500 miles of canals have been constructed in the United States, but not much more than half of this mileage is now in actual use.

Canals of Canada. The comprehensive canal system of the Dominion of Canada is fully described in the article CANADA (Transportation: Canals).

Canals of Europe. Because of the character of the country, the "low countries" (Netherlands) led the other parts of Europe in canal-building, and by 1250 an extensive network of artificial waterways had spread over that region. At the present time, Holland alone has



Photos U & U. Keystone

TWO PICTURESQUE WATERWAYS

At left, the Corinth Canal, cutting the Isthmus of Corinth, in Greece, it was opened to traffic in 1803, after eleven years of construction work. At right, the Rideau Canal, which connects the Rideau and Saint Lawrence rivers. The view is at Ottawa, capital city of the Dominion of Canada.

over 2,400 miles of canals, and Belgium about 1,345. The great canal system of France, now aggregating over 3,000 miles, was begun early in the seventeenth century. This statement means a good deal when it is realized that France is only two-thirds as large as Texas, and yet contains more than half of the mileage in canals boasted by the entire United States. In 1666 the French government began the construction of one of the most celebrated engineering projects of the century, the Languedoc Canal, connecting the Mediterranean Sea and the Bay of Biscay, and 148 miles in length. It was first opened in 1668, and since then has shared with the other waterways of the country in the great sums appropriated by the government for improvement and maintenance. No tolls on French state waterways have been levied since 1888.

Germany's most important canal, the Kiel, or Kaiser Wilhelm, provides a waterway between the Baltic and the North seas. It was completed in 1895, but was later rebuilt and was again opened to navigation in June, 1914. The commercial importance of this watercourse is unquestioned, and its strategic value was demonstrated in the World War. Another notable watercourse is the new Hohenzollern Canal, also opened in 1914. It joins the Oder and Spree rivers, providing waterway communication between Berlin and Stettin on the

Baltic Sea. In the spring of 1915, a canal between the Vistula and Oder rivers was opened, 182 miles in length. Since 1875 the government has been engaged in the systematic reorganization and development of its waterways; rivers have been dredged, that is, canalized, to make them navigable, old canals have been rebuilt, and new ones constructed. The Marseilles-Rhone Canal, fifty-one miles long, was opened in 1927.

The Russian system of artificial waterways was begun by Peter the Great. There are now in the country about 500 miles of canals and over 550 miles of natural watercourses canalized. One of the most noted projects is the canal between Kronstadt, on the Gulf of Finland, and Leningrad, on the Neva River. It is sixteen miles in length and 20.5 feet deep, and cost \$10,000,000. In the period just before the outbreak of the World War, the government appropriated between \$8,000,000 and \$12,000,000 a year for waterway development. The Danube River is the most important watercourse in Central Europe, but there is also a canal system, local in character, which adds about 1,700 miles to the natural waterways of the mid-continent. In Greece is the important Corinth Canal, across the isthmus which joins the Peloponnesus to the northern part of the country. It is one of the world's famous short canals.

Canals of the United States

CANALS	Cost of Construction*	Length, Miles	Depth, Feet†	LOCATION
Albemarle and Chesapeake..	\$1,641,363	11½	12	Norfolk, Va., to Albemarle Sound, N. C.
Augusta	1,500,000	7	10	Savannah River, Ga., to Augusta, Ga.
Beaufort ..	502,078	20	10	Beaufort Inlet, N. C., to Pamlico Sound.
Black River	3,581,954	35	4	Rome, N. Y., to Lyons Falls, N. Y.
Black Rock Channel.	3,000,000	3½	22	Connects Lake Erie and Niagara River at Buffalo, N. Y.
Brazos River ..	255,000	32	5	Brazos River to Matagorda Bay, Tex.
Cape Cod (ship canal) ..	12,000,000	8-13	25-30	Connects Buzzard's Bay and Barnstable Bay
† Cayuga and Seneca	2,232,632	23	7	Montezuma, N. Y., to Cayuga and Seneca Lakes, N. Y.
† Champlain ..	4,041,000	61	6	Whitehall, N. Y., to Watervliet, N. Y.
Channel	450,000	32	5	Between Appalachicola River & St Andrews Bay, Fla.
Chesapeake and Delaware	4,000,000	14	9	Connects Chesapeake and Delaware Bays
Chesapeake and Ohio	11,290,327	18½	6	Cumberland, Md., to Washington, D. C.
Colbert Shoals	2,350,000	8	7	Colbert Shoals, Tennessee River, Ala.
Company	90,000	23	4½	Miss. Riv. at New Orleans, La., to Bayou Black
Dalles-Celilo	1,800,000	8½	7	Columbia River, from Big Eddy to Celilo Falls, Ore
Delaware and Raritan	4,888,749	66	7	New Brunswick, N. J., to Bordentown, N. J.
Delaware Division	2,431,350	60	6	Easton, Pa., to Bristol, Pa.
† Erie	52,540,800	339	7	Albany, N. Y., to Buffalo, N. Y.
Estherville-Minim Creek	174,619	5	6	Winyah Bay, S. C., to Santee River
Fairfield	50,000	4½	5	Alligator River to Lake Mattamuskeet, N. C.
Florida East Coast	3,500,000	350	5	Mayport, Fla., to Miami.
Galveston and Brazos	310,000	38	5	Oyster Bay, Tex., to Brazos River, Tex.
Harlem River (ship canal)	2,700,000	8	15	Connects Hudson River (via Spuyten Duyvil Creek) and Long Island Sound
Illinois and Michigan	6,130,098	96	5	Chicago, Ill., to La Salle, Ill.
Illinois & Mississippi (Hennepin)	7,320,000	75	7	Illinois River to Miss. River near Rock Island, Ill
Lake Drummond	2,800,000	22	9	Connects Chesapeake Bay with Albemarle Sound
Lake Landing	25,000	4	5	Lake Mattamuskeet to Wysocking Bay, N. C.
Lake Washington Puget Sound	5,000,000	6½	36	Connects Lake Washington and Puget Sound
Lehigh Coal and Navigation Co	4,455,000	108	6	Coalport, Pa., to Easton, Pa.
Lewes	356,000	11½	6	Connects Rehoboth and Delaware Bays
Louisville and Portland	5,716,686	2½	9	At Falls of Ohio River, Louisville, Ky
Mattamuskeet Out Fall	500,000	7	10	Hyde County, N. C.
Miami and Erie	8,062,686	274	5½	Cincinnati, Ohio, to Toledo, Ohio
Miami and South New River				Lake Okeechobee to Miami, Fla.
Morris	5,100,000	103	5	Jersey City, N. J., to Phillipsburg, N. J.
Muscle Shoals and Elk R. Shoals	3,150,919	16	5	Big Muscle Shoals, to Elk River Shoals, Tenn
North New River				Lake Okeechobee to Ft. Lauderdale, Fla
N. J. Coastal Inland Waterway	150,000	114	6	Cape May to Bay Head, N. J.
Ohio	(a) 4,095,204	70	4	Cleveland, Ohio, to Dresden, Ohio
† Oswego	5,239,526	23	12	Oswego, N. Y., to Syracuse, N. Y.
Panama	375,000,000	50	41-45	From Colon to Panama across the Isthmus of Panama
Pennsylvania	7,731,750	193	26	Columbia, Northumberland, Wilkes-Barre, Pa
Portage Lake and Lake Superior	1,725,000	25	20	From Keweenaw Bay to Lake Superior
Port Arthur (ship canal)		7	26	Port Arthur, Tex., to Gulf of Mexico
Sabine-Neches.	1,081,000	10	5-8	Port Arthur Canal to mouth Sabine River, Tex
Salem	70,000	10	5	Salem River to Delaware River.
Santa Fe	4,000,000	1½	18	Waldo, Fla., to Melrose, Fla
Sault Ste. Marie (ship canal)	12,161,600	108	6½	Connects Lakes Superior and Huron at St Mary's Riv
Schuylkill Navigation Co	287,000	1½	20	Mill Creek, Pa., to Philadelphia, Pa
Sturgeon Bay and Lake Michigan	1,180,000	3	70	Between Green Bay and Lake Michigan
St. Clair Flats	9,400,000	1½	18½	Canal through delta at mouth of St. Clair River
St. Mary's Falls				Connects Lakes Superior and Huron at Sault Ste Marie, Mich
St. Mary's Falls (parallel canal)	9,175,000	1½	24½	Connects Lakes Superior and Huron
West Palm Beach		12		

Canals of Canada

Chambly	\$728,000	12	6½	This canal overcomes the rapids between Chambly and St. Johns
Cornwall	7,242,804	11	14	Cornwall to Dickinson's Landing
Lachine	13,401,070	8½	14-18	Montreal to Lachine.
Rideau	5,531,332	133½	5	Connects River Ottawa with Lake Ontario
Sault Ste. Marie (ship canal)	5,000,000	1½	18½	Connects Lakes Superior and Huron at St Mary's Riv
Soulanges	8,000,000	14	15	Cascade Point to Coteau Landing
Trent	13,611,000	236	6-8½	Connects Lake Ontario and Lake Huron via Trent Riv
Welland (ship canal)	\$20,250,951	26½	14-25	Connects Lake Ontario and Lake Erie
†† Williamsburg	10,400,184	12½	0-14	Along St. Lawrence River.

* And improvements † Navigable depth || Under construction § Not including cost of improvements and changes in locks, etc., now under way and involving an additional cost of about \$20,000,000 †† Consisting of the Farran's Point, Rapide Plat, and Galop Canals. (a) Original cost of canal extending from Cleveland to Portsmouth, 317 miles, but now abandoned between Portsmouth and Dresden. ‡ The Erie, Oswego, Champlain, and Cayuga and Seneca canals have been enlarged by the state of New York to a depth of 12 feet, and they now comprise the New York State Barge Canal

Some Foreign Canals	Length, Miles	Depth, Feet	Bottom Width, Feet	Estimated Cost
Suez—Mediterranean and Red Sea	103	35	108	\$127,000,000
Kronstadt—Leningrad	16	20½		10,000,000
Manchester—Manchester and Liverpool	35½	28	120	85,000,000
Kaiser Wilhelm (Kiel Canal)—Baltic and North Seas	61	36	72	40,000,000
Elbe and Trave	41	10	72	6,000,000
Berlin-Stettin (Hohenzollern Canal)	136	9 8	32-30	12,500,000

The most important canal in the British Isles, and one of the most remarkable in the world, is that between Manchester and East-ham, on the Mersey River, six miles from Liverpool. Opened for traffic in 1894, it has since been enlarged and improved. Other notable British canals are the Grand Canal, 165 miles long, between Dublin and Ballinasloe, on the River Shannon; the Caledonian Canal, extending across Scotland from Inverness to Fort William; and the canal between the firths of Forth and Clyde, thirty-five miles in length. There are in the United Kingdom about 4,700 miles of artificial waterways, 4,000 of this mileage belonging to England and Wales.



CANARIES

E.D.F.

Related Subjects. Of the canals of the world, the following are treated in separate articles in these volumes:

Cape Cod	New York State Barge
Chesapeake and Ohio	Nicaragua
Chicago Drainage	Panama
Corinth	Rideau
Erie	Sault Sainte Marie
Hennepin	Suez
Illinois and Michigan	Trent
Kaiser Wilhelm	Welland

CANALS OF CANADA. See page 1161.

CANAL ZONE. See PANAMA, subhead;
PANAMA CANAL, subhead.

CANARY, *ka na' rie*, a beautiful little bird of the finch family, the best loved of all the cage birds because of its remarkable gift of song and its cheerfulness and friendly characteristics. It was first found in the Canary Islands and Madeira, acquired its name from the former, and was taken to Europe about the beginning of the sixteenth century. Since then it has found its way into households in various parts of the world, and the centuries of breeding and domestication have brought about marked changes in its appearance. In a state of nature, the bird has a dull-green plumage streaked with darker shades, while the canary in captivity is usually a bright yellow, though sometimes orange, reddish, or pale yellow. The wild canary is not more than five and one-half inches long; its tame brother is sometimes eight inches in length. The topknots of some and the long, slender shapes of others are all the results of breeding. The Scotch Fancy canary, with its long, slender, curved body, is one of the strangest varieties.

In the Harz Mountains and other parts of Germany, and in the British Isles and Belgium, the raising of canaries is an important

industry, and large prices are paid for the highest type of singing birds. The birds require a clean cage, good seed, some green food, lime, and plenty of clean water for drinking and bathing. They should have a roomy cage and opportunity occasionally to stretch their wings and fly. In America, the name *wild canary* is often given to the *American goldfinch*, or *thisle-bird*, which, though entirely different, bears a somewhat close resemblance to the captive canaries. D.L.

Scientific Name. Canaries belong to the finch family, *Fringillidae*. Scientific name, *Serinus canaria*.

CANARY GLASS. See FLUORESCENCE.

CANARY ISLANDS, in the Atlantic Ocean, about sixty miles west of the northwest coast



Photo. Saint Clair

HE CANNOT BE HURRIED

A canary getting ready to step into his bath.

of Africa, cover a total area of 2,810 square miles. The islands are thirteen in number, the most important of which is Teneriffe. Six are uninhabited. All are rugged, volcanic, and mountainous, frequently presenting precipi-

tous cliffs to the sea. The most notable peak is that of Teneriffe, which rises to a height of 12,182 feet. The Canaries are not reached directly from America, but by way of European ports. They belong to Spain, and are governed as a province of the realm.

The climate is mild and healthful, and the soil is so fertile that the islands in ancient times earned the name of Fortunate Islands. There are no rivers of note, but there are numerous streams. These contain no fish except eels; in the surrounding seas, also, fish are scarce. All kinds of domestic animals have been introduced and thrive well. The fertile soil produces large quantities of grain, fruit, vegetables, and flowers. Canary birds are so named because first found in these islands.

The inhabitants are darker than the northern Spaniards, and are well formed and hardy. Population, 1925, 509,290.

Derivation of Name. The Canaries were discovered by the Spaniards in 1630 and were named *Canaria*, a word derived from the Latin *canis*, meaning *dog*, for at that time a large, fierce breed of dogs, now extinct, lived there.

CANBERRA, *kan' beh rah*, AUSTRALIA, the capital of the Commonwealth, situated in a Federal territory formerly a part of New South Wales. The city is 204 miles from Sydney and 518 miles by rail from Melbourne, and a short distance from the sea.

Less than twenty years ago, the site of Canberra was in the wilderness, and the development of the "bush capital," as it was derisively called, into a beautiful city is an amazing record of progress. Like the United States, Australia established its capital in a Federal territory independent of the individual states. The city occupies twelve of the 912 square miles in this area. Canberra is laid out in a rectangular shape, with commercial and industrial enterprises on the north side of the Molonglo River, which flows through the city; the government and Parliament buildings are on the southern side.

The careful plans by which the city and its buildings are being constructed are the work of W. Burley Griffin, a Chicago architect, who in 1912 won in the international competition for the capital plans inaugurated by the Australian government. He studied the development of Washington, D. C., and other large cities, and then spent seven years in Australia working with Canberra's builders. No haphazard construction is allowed in the city; the architecture of buildings is supervised to make it conform to a plan; there is a careful street system, allowing for parks, squares, and gardens; and the zoning arrangements divide the residential areas from the commercial centers and government institutions. More than 200 acres within the city are planted to trees and shrubs.

The first steps in the building of the city, including all of the basic engineering and public utilities work and the construction of the Parliament House, were completed in 1927. In that year the city was dedicated, and the new Parliament opened in formal ceremonies, at which King George was represented by his son, the Duke of York. Hospitals, schools, hotels, and homes have been built; and either completed or in the course of construction are a national School of Forestry, Library, Museum of Zoölogy, Military and Naval Colleges, and an Australian university. Population of city and territory, 10,000. See AUSTRALIA.

CANCELLATION, *kan sel a' shun*, is a "short cut" in mathematics. Its purpose is to avoid long and difficult multiplications and divisions, both in whole numbers and in fractions. It is based upon these principles:

(1) Both dividend and divisor may be divided by the same number, and the quotient is unchanged; or, a common factor may be dropped from dividend and divisor and the quotient remains unchanged.

(2) The numerator and denominator may be divided by the same number and the value of the fraction remains unchanged; or, a common factor may be dropped from numerator and denominator and the value of the fraction remains unchanged.

In division, the most common use of cancellation is the division of both terms by 10, 100, and so forth. For illustration:

(1) $6500 \div 1300$. Divide each number by 100 by striking off two zeros in each; then the problem becomes $65 \div 13 = 5$.

(2) $75000 \div 250$. Upon our dividing both terms by 10, the problem becomes $7500 \div 25 = 300$.

But it is also used in the division of both terms by other factors than 10, 100, etc.; for example:

$$2200 \div 55 = \text{quotient}$$

Divide dividend and divisor by 11, and the problem becomes

$$\begin{array}{r} 200 \div 5 = q \\ q = 40 \end{array}$$

See what common factor is taken out in the following:

$$(3) \begin{array}{r} 650 \div 39 = q \\ 50 \div 3 = 16\frac{2}{3} \end{array} \quad (\text{Factor taken out is } 13.)$$

$$(4) \begin{array}{r} 960 \div 36 = q \\ 80 \div 3 = 26\frac{2}{3} \end{array} \quad (\text{Factor taken out is } 12.)$$

$$(5) \begin{array}{r} 225000 \div 450 \\ 22500 \div 45 \\ 1500 \div 3 = 500. \end{array} \quad (\text{Factors taken out are } 10 \text{ and } 15.)$$

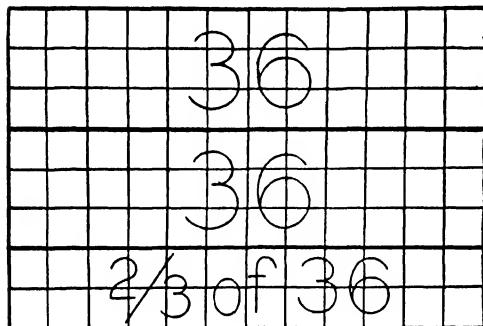
$$(6) \begin{array}{r} 108000 \div 7200 \\ 1080 \div 72 \\ 30 \div 2 = 15. \end{array} \quad (\text{Factors taken out are } 100 \text{ and } 36.)$$

$$(7) \begin{array}{r} 90180 \div 360 \\ 9018 \div 36 \\ 1102 \div 4 = 275\frac{1}{2}. \end{array} \quad (\text{Factors taken out are } 10 \text{ and } 9.)$$

Taking out of factors other than 10, 100, etc., is not so general as it should be. Children's attention should be drawn to it (see FACTORING). Here is an illustration to show the common factor, and why it can be dropped:

$$96 \div 36 = \text{quotient}$$

This reads, "How many 36's in 96?" 96 is made up of eight 12's; 36 is made up of three



12's, as shown in the diagram; then the problem is seen to become, "How many 3 rows in 8 rows?" and then, "How many 3's in 8?"

This put into arithmetical form appears:

$$(8 \times 12) \div (3 \times 12) \text{ or } \frac{8 \times \overset{1}{\cancel{12}}}{3 \times \overset{1}{\cancel{12}}} = \frac{8}{3} = 2\frac{2}{3}$$

Cancellation is used very much more freely when division is written in *fraction* form than when it appears with the division sign (\div);

$$\text{for example, } 13500 \div 270 = \frac{\overset{150}{\cancel{13500}}}{\underset{3}{\cancel{270}}} = \frac{150}{3} = 50.$$

- (a) Divide both terms by 10
- (b) Divide both terms by 9
- (c) Divide both terms by 3

Let us look at cancellation as used in a concrete problem:

"How many blocks of ice 36 inches by 24 inches can be packed in a layer in an ice house 60 feet wide and 90 feet long?"

$$\text{Solution: Number of blocks} = \frac{\overset{10}{\cancel{60}} \times \overset{1}{\cancel{90}} \times \overset{1}{\cancel{24}}}{\underset{1}{\cancel{36}} \times \underset{1}{\cancel{24}}} = \frac{10 \times 90 \times 1}{1 \times 1} = 900$$

- (a) Divide both terms by 24
- (b) Divide both terms by 6
- (c) Divide both terms by 6

and the division appears

$$\frac{10 \times 90 \times 1}{1 \times 1} = 900$$

Cancellation shortens the work in multiplication and division of fractions; for example,

$$\frac{2}{3} \times \frac{7}{8} \times \frac{12}{17} \times \frac{34}{35} \text{ Let this appear } \frac{\overset{2}{\cancel{2}} \times \overset{1}{\cancel{7}} \times \overset{12}{\cancel{12}} \times \overset{34}{\cancel{34}}}{\underset{3}{\cancel{3}} \times \underset{8}{\cancel{8}} \times \underset{17}{\cancel{17}} \times \underset{35}{\cancel{35}}}$$

The numerator of the new fraction is the product of 2, 7, 12, 34, while the new denominator is the product of 3, 8, 17, 35. We may divide the numerator and denominator by the same number without changing the value of the fraction:

- (a) Divide both terms by 3: (3 below and 12 above);
- (b) Divide both terms by 7: (35 below and 7 above);
- (c) Divide both terms by 2: (2 above and 8 below);
- (d) Divide both terms by 17: (34 above and 17 below);
- (e) Divide both terms by 4: (4 below and 4 above); and the product appears as below:

$$\frac{\overset{1}{\cancel{2}} \times \overset{1}{\cancel{7}} \times \overset{1}{\cancel{12}} \times \overset{2}{\cancel{34}}}{\underset{1}{\cancel{3}} \times \underset{4}{\cancel{8}} \times \underset{1}{\cancel{17}} \times \underset{5}{\cancel{35}}} = \frac{2}{5}$$

An illustration in mixed numbers follows:

$$2\frac{1}{2} \times 8\frac{1}{3} \times 7\frac{1}{5} = \frac{5}{2} \times \frac{25}{3} \times \frac{36}{5}$$

- (a) Divide both terms by 5: (5 above and 5 below);
- (b) Divide both terms by 3: (36 above and 3 below);
- (c) Divide both terms by 2: (12 above and 2 below); and we have—

$$\frac{\overset{1}{\cancel{5}} \times \overset{25}{\cancel{25}} \times \overset{6}{\cancel{36}}}{\underset{1}{\cancel{2}} \times \underset{1}{\cancel{3}} \times \underset{1}{\cancel{12}}} = \frac{25 \times 6}{1} = 150$$

A problem in division of fractions becomes a problem in multiplication of fractions, and so cancellation is helpful in division of fractions. For example:

$$(1) \frac{12}{13} \div \frac{9}{26} = \frac{12}{13} \times \frac{\overset{4}{\cancel{26}}}{\underset{3}{\cancel{9}}} = \frac{8}{1}$$

$$(2) 8\frac{5}{9} \div 7\frac{1}{3} = \frac{77}{9} \times \frac{\overset{7}{\cancel{21}}}{\underset{2}{\cancel{3}}} = \frac{7}{2}$$

A.H.

CANCER, *kan' sur*, the common name of a dangerous malignant tumor that may grow in the human body or in the bodies of other vertebrate animals. Cancer is one of the most painful and most dreaded of the diseases that afflict mankind. In spite of the flood of publicity poured on this subject, the great sums of

money expended in its study, and the advance in microscopic methods of diagnosis, cancer remains one of the diseases the medical profession has not yet learned to control. Over 100,000 persons die of cancer every year in the United States, or about one person in every thousand in the whole population. On the other hand, valuable information is now available with respect to contributing causes, prevention, and treatment, and cancer specialists are hopeful that their efforts in research and publicity will bring this disease under control within the next century. See TUMOR.

Nature and Cause. Whatever the site of the cancer, it is known to begin locally. The theory generally accepted is that cancerous tissue forms where certain cells fail to develop normally after division of the parent cells. These new cells multiply wildly, and if unchecked travel to other parts of the body, robbing the normal cells of nourishment and sending their poison through the system by means of blood and lymph. In the beginning, however, cancer is a local and not a generalized disease, though most specialists believe that some biochemical change in the tissues accompanies cancer.

Cancer is not regarded as contagious in the ordinary sense of the term, nor is it transmitted directly from parent to child. It is a fact, however, that cancer is prevalent in certain families, and persons undoubtedly inherit a tendency to acquire the disease. Dr. Maud Slye, of the University of Chicago, after years of experimentation with mice, announced her belief that persons inherit local susceptibility; that is, a tendency to lip cancer or to breast cancer, or to any other form common to the family strain. Mating of susceptible persons results in an increase of the tendency, and vice versa. Anyone who belongs to a susceptible family should take special precautions, be on his guard.

Most people who acquire cancer do so after the age of forty, though young children and adults under forty contribute yearly to the number of cases. Women are most likely to have cancer in the following parts, in the order given: uterus, breast, stomach, liver, intestines, and rectum. In men the most susceptible parts are stomach, liver, rectum, intestines, esophagus, and tongue. Young children are especially susceptible to bone cancer.

Cancers are started by local irritation, as by the rubbing of an ill-fitting dental plate or the stem of a pipe on some part of the mouth, or the rubbing of a garment against the breast. A blow may start a breast cancer. Abscesses and ulcers, sores, warts, moles, and wens, slow to heal or irritated in some way, have been known to develop into cancerous growths. The cause of deep-seated cancers is not always evident. Liver cancer, however, is always a secondary growth having its origin in stomach cancer. It is thought that a wrong diet or too

hot foods—any substance that causes irritation of the lining of the stomach—will cause cancer in that organ. According to one theory, modern living, with its hurry and strain and its excesses, causes the tissues in all parts of the body to age prematurely, and irritation more easily affects them. This theory accounts for the increase of cancer in the most enlightened countries. In the meantime, experimentation is vigorously going on in the effort to isolate a causal microorganism, if such there be.

Treatment. It cannot be too strongly emphasized that cancer is often curable if treated in time. Any lesions on the skin or lips, sores in the mouth, lumps on the breast and other irritations liable to lead to cancer that do not disappear in a few weeks should be removed. Thorough examination and proper treatment at an early stage of the disease are absolutely essential. Cancer of the stomach, the most common form of internal cancer, is curable by surgical operation if not allowed to develop too long. Pain in the pit of the stomach and discomfort after eating, persistent nausea and vomiting are early symptoms that should impel the victim to seek an examination. Such examination should include tests of the stomach contents, the feces, and the blood, together with an X-ray examination. Anaemia, vomiting of blood, emaciation, and swelling of the ankles are other indications, but they appear after the disease has made considerable headway, and is no longer curable.

The use of the X-ray and radium in the treatment of some superficial cancers has brought good results, but these remedies are not effective for deep-lying malignant growths, nor do they cure superficial cancers that have been allowed to go too long. If the growth has spread to the lymph glands, these agents are of no avail. They do not help in cases where the skin is unbroken, as in cancer of the breast. They are usually successful in cancer of the lip. Removal of cancerous growths by knife is the most effective cancer cure, considering all cases and all conditions. Cancer will come back if the operation is not successful in removing surrounding tissue that has become contaminated. If the poison has penetrated into the blood new growths may occur in other places. The lesson to be learned from all these facts is early examination and early treatment.

The most curable form of cancer is cancer of the skin. This is generally called *epithelioma*. This is partly because such cancers are in sight and therefore are generally diagnosed early. It is partly because cancer in the skin is not very malignant. The impulse of the cells to grow in a wild and lawless fashion or to travel from the point of origin to the glands or other points is not great, nor is there much absorption of the poisonous material secreted by cancers. Skin cancers, if diagnosed early, can be cured by

any one of several methods. Any chronic skin patch which becomes sore and remains so, or which develops a red base or ulcerates and oozes, should be examined carefully for evidence of cancer.

Sarcoma is a form of malignant tumor which is sometimes called cancer. The cells making up a sarcoma are derived from connective tissue. Those which form cancer are derived from epithelium.

Considerable research is now being done regarding the curative properties of lead. Workers in lead appear to be free from cancer, and the theory has been advanced that the metal has a destructive effect on cancer cells. Injections of lead have given promising results in selected cases, and future investigation may result in a standardized method of treatment

W.A.E.

Derivation. The name *cancer* is from a Greek word meaning *crab*, and has reference to the appearance of the enlarged veins around the swelling. The technical name for cancer is *carcinoma*. *Scurrhus* is a term applied to hard cancers, soft cancers are known as *encephaloid*, skin cancers as *epithelial*.

CANCER (the crab), the fourth sign of the zodiac, entered by the sun on or about the twenty-first of June and quitted a month later. The symbol is ☉. The constellation of Cancer is no longer in the sign of Cancer, but at present occupies the place of the sign of Leo. The Tropic of Cancer is the name given to the northern tropic. According to mythology, Cancer is the crab that attacked Hercules when he was destroying the Hydra (which see). F.B.L.

Related Subjects. For additional information, the reader is referred to the articles

Precession of the
Equinoxes

Tropics
Zodiac

CANCER, TROPIC OF. See TROPICS; ZONE.

CANDIA, the capital of Crete (which see).

CANDLE AND CANDLE POWER. With-in the memory of persons still living, candles were in general use for lighting the home. They are still so employed in some country houses lacking modern methods of illumination, and will probably never lose their popularity for decorative effects. They are, of course, indispensable for religious purposes. Tallow, bees-wax, paraffin, palm oil, and sperm oil have all been used in candle-making, but most modern candles are manufactured from stearin, a commercial product obtained by mixing stearic and palmitic acids. In the process of manufacture, the stearin is mixed with a little wax or paraffin, to overcome the tendency of the material to contract on cooling. Wax is largely used for altar candles. Dipping, rolling, and molding are the various processes employed in making these cylindrical rods, but molding is now in most general use. Wicks are made from braided or twisted yarn.

Candle Power. This is a unit adopted as a measure of the light-giving capacity of lamps. The oldest standard lamp is the *British standard candle*, a spermaceti candle of specified weight that burns at the rate of 120 grains per hour (see PHOTOMETRY). The illuminating power of a horizontal beam from this candle is a *candle power*. Because this standard is inadequate for scientific purposes, the *international candle* has been adopted by the United States, England, and France. The international candle is defined as a light with an illuminating power equal to one-tenth that of a Harcourt pentane lamp, in which air is drawn over pentane vapor and the mixture burned according to certain specifications. An electric lamp having an illuminating power forty times that of the international standard candle is said to give forty candle power. The illumination which the standard candle throws upon a surface one foot away, and at right angles to the rays of light, is called a *foot-candle*.

It is evident that candle power is an intensity in a definite direction. The most modern electric lamps are so made that it is inconvenient to compare them by the candle power, and the standard of comparison adopted is a *definite quantity of light*, called the *lumen*. A lumen is defined as the amount of light that would fall on a sheet of paper one foot square if it were placed so that all parts of it were one foot distant from a candle of one candle power. The newer lamps are sold according to the light they give in all directions. See LIGHT; PHYSICS.

A.L.F.

CANDEBERRY, OR BAYBERRY, OR WAX MYRTLE, an evergreen shrub from whose wax-covered berries the popular bayberry candles are made. These burn with a pleasant, piny odor, and are connected by tradition with Christmas, the old belief being that on that day—

A bayberry candle burned to the socket
Brings health to the body, joy to the heart,
And gold to the pocket.

The berries with their coating of wax are boiled, and the greenish-white tallow is skimmed from the surface. From a bushel of berries, four or five pounds of wax may be obtained. The shrub is found all along the eastern coast of North America from the Maritime Provinces to Louisiana, and is often planted as an ornamental. See TALLOW TREE. B.M.D.

Scientific Name. The candleberry belongs to the sweet gale family, *Myricaceae*. Its botanical name is *Myrica carolinensis*.

CANDLEFISH, a salt-water fish, from twelve to fifteen inches long, belonging to the smelt family. It derives its name from a peculiar custom among the Indians of Alaska, whose coasts it frequents. The Indians literally make a candle of it by drying it and forcing through

it the pith of a rush or a strip of bark as a wick. When the wick is ignited, it burns freely. The extreme oiliness of the fish, strangely enough, is not unpleasant to the taste, for the oil has a fine flavor. When fried, the flesh is considered superior to that of the trout. The oil is sometimes extracted and is used as a substitute for cod-liver oil. L.H.

CANDLEMAS DAY. See FEBRUARY.

CANDY, a name given to almost any sweet-meat which has sugar as its main ingredient. Different methods of making, with the addition of various flavorings, fruits, nuts, or other ingredients, produce almost innumerable kinds of candy, and the demand is so great that new and tempting combinations are being constantly evolved. The United States uses more candy than any other nation.

If the candy that is eaten each year were evenly distributed among the inhabitants of the country, it would not be at all harmful. Physicians generally agree that a moderate amount of pure candy, eaten immediately after a meal, is thoroughly wholesome, for the system needs a certain proportion of sugar. If eaten constantly, however, at intervals during the day, even the best candy will do harm in many ways. Especially important is it that children should not eat much candy, and that such as they do have should be pure.

As in all industries, there have been constant improvements in methods of making candy. Manufacturers are now compelled by the laws of most states and provinces to keep their factories clean, light, and airy. Then, too, the harmful coal-tar preparations which were once used to color candies are generally forbidden by pure-food laws, so that a person may to-day buy colored candies without the fear that they are poisonous. Even green-colored candy, formerly avoided because it was supposed to contain arsenic, is now harmless, for in almost all cases the dye used is simply spinach juice. See ADULTERATION OF FOODSTUFFS AND CLOTHING.

[For illustrations, see pages 1168 1169.]

The Making of Candy. There are so many kinds of candies that an enumeration of them and of the methods of manufacture would be an impossibility, but they divide themselves naturally into certain classes. All cream candies, for instance, have as their basis what is called a *fondant*. This French term is commonly used because France was for a long time the only country which could make these creams in perfection. The fondant is made, in the factories, by adding to a large quantity of sugar a small amount of glucose, and boiling the whole with water until a thick, clear syrup is obtained. This is poured upon huge marble slabs, allowed to cool, and then worked with long paddles until it becomes white,

creamy, and smooth. Innumerable kinds of candy are made with this fondant as a basis—chocolates, bonbons, patties, nut- and fruit-nougats, coconut creams, and so on.

Fondant is easily made in the home by boiling together two cups of granulated sugar, one cup of water, and a very little cream of tartar. When the syrup has become thick, it is allowed to cool, and is then beaten with a spoon or paddle until it has a creamy consistency.

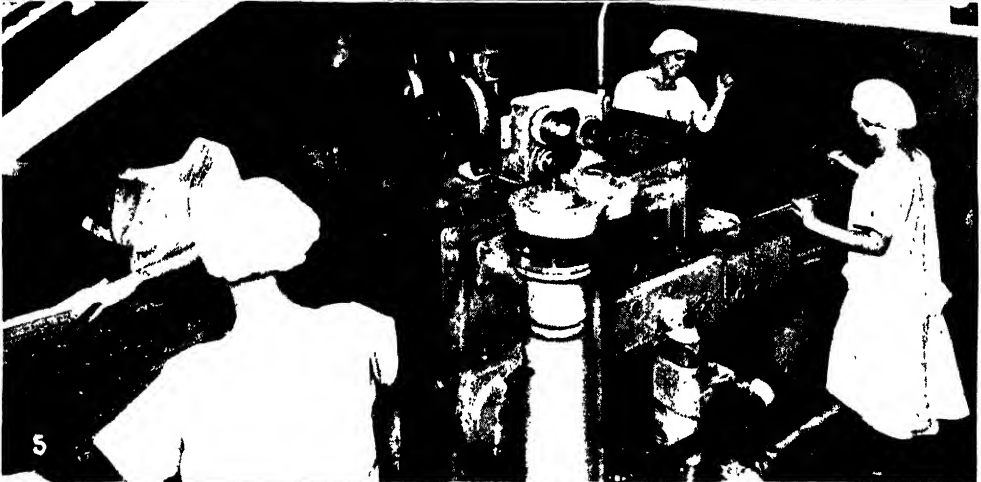
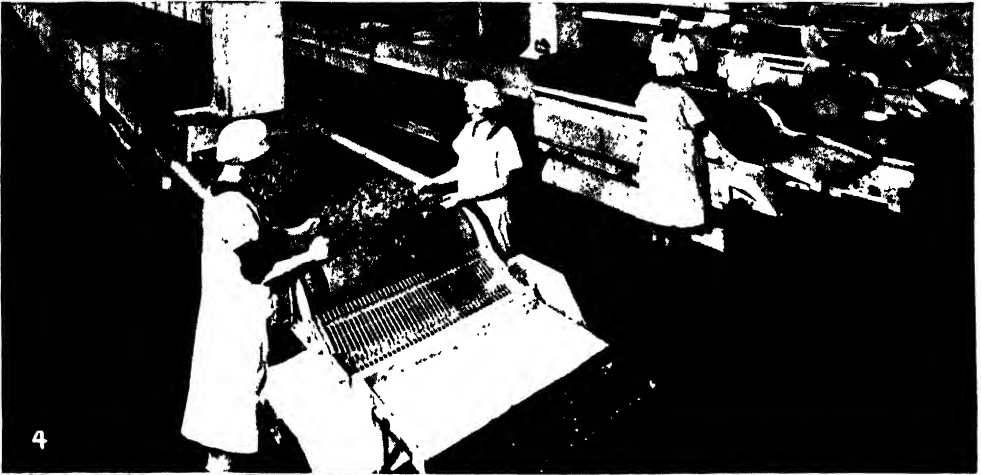
Hard candies are made of sugar and water boiled to a heavier syrup than is the fondant. It is colored and flavored, then allowed to harden without being stirred or beaten. Much of the stick candy is still rolled out by hand. Caramels of the best grade are made of sugar and pure cream, boiled until the product is of a proper consistency, and cooled on marble slabs. The candied fruits, nuts, and flowers which have become so popular in recent years are made by dipping them into a syrup which has been boiled until it is just on the point of recrystallizing into sugar. Chocolate creams, too, are a dipped candy, the fondant centers being thrown into the chocolate and lifted out with a wire spoon. Perhaps there is no candy which is more popular than the various kinds of chocolates, and the demand for them has caused a vast increase in the chocolate business (see CHOCOLATE). E.V.M'C.

CANDYTUFT. The candytufts are flowering plants belonging to the mustard family. They take their name from *Candia*, the old English name for the island of Crete, from which the seeds were carried to England in the sixteenth century. Three species of candytuft are well-known garden flowers, easily cultivated in ordinary soil. *Purple candytuft* grows to a height of about one foot, and bears its flowers in flat-topped clusters, the blossoms in the center of the cluster being smaller than those on the edge. The four petals, pink or pale purple in color, show an irregularity that is typical of the candytuft group, for the two outer petals are much longer than the others. A garden bed of this species, with the shades of pink and purple melting into each other on the nodding flower heads, is a most attractive sight.

Bitter candytuft, grown in gardens and also found as a weed in Western and Central Eu-



CANDYTUFT



(4) Machines 140 feet long cool the candy at the rate of 18,000 bars every hour (5) Machines that give the candy a thick coating of milk chocolate. (6) Each conveyor shown brings from fifteen to seventeen tons of candy every eight hours, which is rapidly boxed for trade.

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rope, is a small plant six to twelve inches high, whose erect, branching stem bears white, sometimes purple-tinted, flower clusters. The root, stem, leaves, and seeds of this species are said to have medicinal properties. *Evergreen candytuft*, a lover of warm climates, is valued for its abundant, pure-white flowers. In a favorable climate, these flowers remain in bloom throughout the winter. B.M.D.

Scientific Names. The candytufts belong to the family *Cruciferae*. Purple candytuft is *Iberis umbellata*; bitter candytuft, *I. amara*; evergreen candytuft, *I. semperflorens*.

CANE, the name applied to various plants which have a reedlike stalk or stem, including the sugar cane and bamboo among the grasses, and the rattans among the palms. The stems of plants of this type are of untold value to man, because of their lightness, strength, and flexibility. In tropical countries of the East, for instance, where the bamboo flourishes, the natives use the plant both for the framework of the house and its furnishings. Batavia, in Java; Sarawak, in Borneo; Singapore and Penang, in the Straits Settlements; and Calcutta, in India, are centers of a flourishing trade in canes and rattans, which are exported in large quantities to the Western European countries, Canada, and the United States. In these latter countries, fishing rods, walking sticks, umbrella handles, baskets, chair seats, and many other articles made from cane plants are familiar objects.

Because so many walking sticks have been made of the wood of these plants, the term *cane* is now applied without discrimination to any walking stick. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles:

Bamboo	Rattan	Sugar Cane
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CANEBRAKE. See BAMBOO.

CANE SUGAR. See SUGAR (Cane Sugar)

CANFIELD, DOROTHY (1879-), an American novelist whose sincere treatment of modern life and its problems is greatly admired by thoughtful readers. In private life, the author is Mrs. John R. Fisher. She was born at Lawrence, Kan., and was educated at Ohio State University and at Columbia University. In 1911 she and her husband made a trip to Rome, and while there Miss Canfield assisted Madame Montessori in translating the latter's exposition of her educational system. In 1913 Miss Canfield's *A Montessori Mother*, which became known internationally, was published. The author spent three years in relief work in France during the World War, and also gave time and thought to the educational problems of Vermont, where she resided after her marriage in 1907.

Her Principal Books. These are *The Squirrel Cage, Mothers and Children, The Bent Twig, Hillsboro*

People, Understood Betsy, Home Fires in France, The Brimming Cup, Rough-Hewn, Raw Material, The Home-Maker, and Her Son's Wife. She also translated, with sympathetic insight, Papini's *Life of Christ*.

CANINES (dog teeth), *ka ninze'*. See TEETH.

CANIS MAJOR, *ka' nis ma' jur*, called the GREAT DOG, is a constellation in the southern hemisphere containing Sirius, the Dog Star, the brightest star in the heavens. The dog is the faithful companion of the mighty hunter Orion, whom he eternally watches over in the sky. The three familiar stars forming the belt of Orion point directly down to the nose of the dog formed by the star Sirius, one of the nearest to earth, but so distant that it takes nine years for its light to reach us. F.B.L.

Related Subjects. The reader is referred in these volumes to the chart, *The Heavens in Autumn and Winter*, in the article ASTRONOMY. See, also, SIRIUS.

CANKER, *kang' kur*, a small, painful superficial ulcer which appears in the mouth. Canker may be multiple. The usual location is the inner lining of the cheeks, though other parts of the mouth may be involved. Canker heals quickly after being touched with alum, nitrate of silver, or acid. Canker results from eating a badly balanced diet or from constipation. To prevent the trouble, the eating habits or the bowel habits should be modified. W.A.F.

CANKERWORM, *kang' kur wurm*, the caterpillar of any species of canker moth. There are two species important to agriculture because the larvae seriously damage orchard and shade trees. These are the *spring* and the *fall* cankerworms. The female moths of both species are wingless. The moths of the spring species emerge from the pupal cases in early spring, and those of the other species come out in October. Both forms pupate in the ground and lay their eggs in trees. The mother moths of the fall species deposit their eggs in the fall, but the larvae hatch the following spring, about the time the young leaves on apple trees are unfolding.

The spring cankerworms hatch about the time the elm leaves unfold. The worms are about an inch long when full grown, and are greenish-brown, with pale-yellow stripes up and down the back. The spring cankerworm has eight stripes; the fall species, six. They crawl by drawing the hind feet up to the forefeet, making a loop of the body. These loopers are greedy eaters, and can strip an orchard or grove of foliage in a few days. When the worms are disturbed, they drop from the leaves and hang suspended by silken threads.

Since the wingless female moths have to climb the trees to lay their eggs, they can be kept out of the trees if bands of cloth or paper, smeared with some sticky substance,

are fastened around the trunks early in the spring. The worms can be destroyed by spraying the trees with lead arsenate. W.J.S.

Classification. The cankerworms belong to the family *Geometridae*, or *measuring worms* (which see). The spring cankerworm is *Paleacrita vernata*; the fall species, *Anisopteryx pometaria*.

CANNA, kan' ah, one of the most brilliant and ornamental of garden plants. Its development has been achieved within recent years, and now no plant is more popular for large



CANNA

beds or as backgrounds for lower-growing flowers in a formal setting. For the canna is tall—frequently as tall as a man; and even the so-called dwarf varieties are four feet in height. The large leaves, dark green or bronze, spread about the central stock, at the end of which appear the gorgeous red, yellow, or orange flowers. Cannas are very easily grown, few plants repaying more generously the care expended upon them. They need a rich, warm soil and plenty of moisture; and the blossoms as they wilt should be picked, to prevent seeding. At the close of the flowering season, the big root may be dug up, kept from freezing through the winter, and replanted in the spring. B.M.D.

Scientific Name. The canna is a member of the family *Cannaceae*. The species originally cultivated is *Canna indica*.

CANNABIS, kan' nah bis. See HASHISH.

CANNAE, kan' e, an ancient town connected with a notable battle in the campaign of

Hannibal (which see) against the Romans. The date was August 2, 216 B.C. Hannibal had 40,000 foot-soldiers and 10,000 mounted men; the Romans had 80,000 on foot, and about 6,000 mounted. Hannibal's Carthaginians were formed in a semi-circle; the Romans attacked the center and broke through. This was according to the strategy of Hannibal, for as the Romans rushed ahead, the two semi-circular flanks of Carthaginians closed in on the enemy and hemmed them in on the sides and the rear. The Romans lost 10,000 men by capture, and thousands were killed.

CANNEL, kan' el, COAL, a compact variety of bituminous coal. See COAL.

CANNIBAL, kan' i bahl, a person who eats human flesh. Spanish discoverers at the time of Columbus found that the custom of eating their fellow beings existed among the Caribs, a West Indian tribe, and from their name came the modern word. Man-eating races north-east of the Caspian Sea were mentioned, however, by the Greek historian Herodotus and other ancients, and reference is made to the practice in the writings of Marco Polo (which see), an Italian adventurer of the thirteenth century. The early North American Indians were accustomed to eat their prisoners in time of war, and even so highly civilized a race as the Aztecs of Mexico consumed the human victims offered as sacrifices to their god of war. The heart of a brave man was regarded as an especially choice morsel. Cannibalism once prevailed among the savages of West and Central Africa, New Guinea, the Fiji Islands, Australia, and New Zealand, and is still practiced in some of the islands of the Pacific.

Among some races, cannibalism began as a religious rite, and in the course of time there developed a natural appetite for human flesh. Others have believed that the virtues of the deceased passed on to the one who ate of his flesh, and so children often consumed their dead parents. In some cases, men have eaten human beings simply because there was lack of other food supply. Even highly civilized beings may be driven to eat of human flesh by extreme hunger, as is shown in the records of sieges and shipwrecks.

Cannibalism and cannibals are mentioned frequently in stories of adventure and travel, a well-known instance being the rescue of Friday from the cannibals by Robinson Crusoe. Stories are told of mariners adrift at sea who cast lots to see which one should be killed and give his body to satisfy the hunger of his companions. Even in cases of dire necessity, however, such a proceeding is not held to be justifiable, and there are cases on record of the trial, condemnation, and punishment of rescued sailors who had during their apparently hopeless hours resorted to this course. C.W.



CANNING CLUBS represent a phase of the boys' and girls' club work fostered by the Coöperative Extension Service of the United States Department of Agriculture. This movement originated in Wright County, Iowa, as early as 1905, but it was not until 1912 that the Department of Agriculture gave any financial assistance. In 1914, Congress passed the Smith-Lever Act, appropriating funds for the organization and supervision of boys' and girls' clubs throughout the country, in connection with the state agricultural colleges. The development of this movement and details of the organization of boys' and girls' 4-H clubs, as they are now called, are given in these volumes under the heading **BOYS' AND GIRLS' CLUBS**. This article deals with the activities of the girls' food-preservation clubs.

Equipment. Club members find that best results are obtained when the utensils and other equipment are carefully chosen and are arranged in an orderly way. The systematic worker has a clock in a convenient position, for each step of the process is timed, and within easy reach there are a thermometer and a set of graduated scales. She also does not forget her notebook, in which records are carefully written as the work proceeds. Pans and tins, a canning boiler, plenty of clean cloths and towels, an abundant supply of pure, clean water, sharp coring and paring knives, jars, tops, rubbers, labels, etc., are of course essential. Tin cans with solder-hemmed caps are used for putting up many fruits and vegetables. Glass jars, tops, and rubbers are kept in a pan of warm water on the back of the stove, until ready for use. For canning all kinds of fruits and vegetables, steam-pressure canners have been found most successful. Steam under pressure raises the heat to about 250° F., and makes possible complete sterilization. A wash boiler, or other vessel with a close-fitting top, can be turned into a home canner by making a false bottom with lifting handles. Such a device is adequate for canning on a small scale, and is known as a hot-water-bath outfit.

Definitions and Methods. The successful canner must be familiar with several terms that are peculiar to this household art. The more important of these are here listed:

Scalding. Dipping fruit in boiling water for the purpose of removing the skin.

Blanching. Boiling quickly in water. This is done by placing fruit or vegetables in a cloth bag and lowering it into the water. Purposes—to eliminate acids and other bitter substances; to reduce bulk of vegetable greens.

Cold Dipping. Plunging food products into cold water immediately after blanching, to harden the pulp under the skin, and to make it easier to handle products in packing.

Sterilizing, also known as *processing* Boiling fruits or vegetables for a certain period after completely sealing the container. The object is to destroy germs.

Tinning the Steel. Putting the hot steel used for capping tins in sal ammoniac and solder, turning the steel several times until it is smooth and bright, and then dipping it in soldering "flux."

Capping. Soldering the solder-hemmed tops on the cans with the capping steel.

Tipping. Sealing the air hole, or vent, in the center of the tin cap.

Flux. Prepared by adding to muriatic acid as much zinc as will dissolve, and then adding water equal in amount to acid. The fluid is used to clean the steel and to wipe surfaces to be soldered. When applied to tin, it adds a coating of zinc, to which the solder will readily adhere. It should be applied carefully, and none should be permitted to run inside the can.

It is not possible here to give all of the standard recipes used by club members in canning the different varieties of fruits and vegetables, but the following directions illustrate the methods employed:

For Canning Soft Fruits. Can the fruit the day it is picked. Grade; then rinse by pouring water over fruit through a strainer. Cull, seed, and stem. Pack at once in glass jars or tin cans. Add thin, boiling-hot syrup. Place rubber and top in place, and partially tighten. (Cap and tip tin cans.) Sterilize in hot-water bath outfit sixteen minutes, or in steam-pressure outfit under five pounds steam ten minutes. Remove jars. Tighten covers and invert to cool. Wrap in paper and store.

For Canning Tomatoes. Grade according to size, ripeness, and color. Scald in hot water, to loosen

skins Dip quickly into cold water, and then take out. Core and skin. Fill container with whole tomatoes, adding one level teaspoonful of salt to a quart. Place in position rubber and cap. Partially seal, but not tight. (Cap and tip tin cans.) Sterilize

Related Subjects. More or less directly connected with the above theme are the following articles, which will be found in their alphabetical order in these volumes.

Boys' and Girls' Clubs
Food Products,
Preservation of

Fruit
Gardening
School Garden



CANNING EQUIPMENT

Includes a pressure cooker, which is being demonstrated to a student.

twenty-two minutes in hot-water-bath outfit, or fifteen minutes in steam-pressure outfit under five pounds steam. Remove jars, tighten covers, invert to cool. Wrap in paper and store.

Club Demonstrations. Meetings for all the club members, at which the standard methods of canning are demonstrated and principles and terms are explained, are of great practical value. Those conducted in the school, attended both by pupils and their mothers, are of special interest. The teacher or leader makes all arrangements before the demonstration begins, placing in order the canning outfit, tables, supplies, food products, etc., and seeing that the fire is in readiness. The club members are then called to order, preliminary instructions are given, and each pupil is assigned a task. By varying the work, each member is able to participate in all the canning processes, from preparing the containers and fruit to labeling the cans and entering the records. Then follow the clearing up and putting away of the apparatus. To add variety and interest, contests are sometimes introduced; different members compete to see who is quickest and most efficient in canning a specified amount of fruit, or in scalding, filling, labeling, etc.

The work in canning can be easily correlated with other school subjects—geography, history, physiology, reading, composition, and arithmetic—and the pupils who cultivate their own plots of ground, and can the produce which they themselves raise, are learning practical lessons in agriculture.

E.V.M'C.

CANNON, a term applied in former days more than at the present time to big guns, as distinguished from any kind of small firearms. To-day large guns are designated by classes, as howitzers, mortars, "75's," etc. The name was first used about the beginning of the fifteenth century and was derived from the Latin word *canna*, which means a *tube* or *reed*. See **ARTILLERY**.

CANNON, ANNIE JUMP. See **WOMEN, TWELVE GREATEST AMERICAN**.

CANNON, JOSEPH GURNEY (1836-1926), an American legislator and politician, except for two intervals of two years each a member of the Federal House of Representatives from 1873 to 1923, and its Speaker from 1903 to 1911.

Cannon was one of the most picturesque figures in public life. Very tall, thin, and angular, yet wiry and seemingly weather-

beaten, his was a figure to delight the caricaturist. He became famous as a wit and a storyteller, yet on occasion could be most uncommunicative.

His humor, his unconventionality, his bluntness, and his ability to make personal friends of his bitterest political opponents were notable. Though he was born in the South, at Guilford, N. C., his home for over half a century was in Danville, Ill., where everybody knew him as "Uncle Joe." This title accompanied him to Congress, and as "Uncle Joe" Cannon he was known to millions who never saw him.

Cannon was admitted to the Illinois bar in 1858, and only three years later was elected to his first public office, state's attorney of Vermilion County, of which Danville is the county seat. This position he filled with ability until 1868. He became a member of the House of Representatives in 1873, and was re-elected without interruption until 1891. During this period he gradually became one of the leading Republicans in that body, and from 1880 to 1891 was chairman of the committee on appropriations. Like many other Republicans, he was defeated for reelection for the term



Photo U.S.U.

JOSEPH G. CANNON

For more than a generation a leader in the American Congress.

1891 to 1893, but in the latter year again took his seat. He was again chairman of the committee on appropriations, from 1897 to 1903, and was then chosen Speaker.

Cannon perfected the system installed by Thomas B. Reed by which the Speaker controlled legislation, and he ruled, it must be said, with no uncertain hand. He appointed all committees, and he himself was chairman of the committee on rules, which determined the methods of transacting business in the House. A movement to change the rules, and especially to remove the Speaker from the committee on rules, began soon after Cannon became Speaker, and was finally successful in 1910. Thereafter the Speaker was not a member of the committee on rules, and that committee itself was chosen by a caucus of Representatives. When Congress met in 1911, the Democrats elected Champ Clark as Speaker. Cannon failed of reelection in 1912, and was not in Congress from 1913 to 1915, when he was again elected. He retired in 1923.

CANNON BALL RIVER. See NORTH DAKOTA (Rivers and Lakes).

CANNON-BALL TREE. In various places in South America, from Brazil northward to Central America, the cannon-ball tree is a peculiar and interesting specimen of plant life. The name refers to the fruits, which are similar to cannon balls, both in size and shape. In its general aspect, the tree is not unlike the elm, but about the lower part of its trunk is a mass of tangled, crooked branches, characteristic of this tree alone. These lower branches, though leafless, bear the flowers and the large,



Photo. Field Museum of Natural History

CANNON-BALL TREE

Fruit and fruit-bearing trunk. The photograph is from Guiana.

ball-shaped fruits. On the upper limbs are borne the leaves. The flowers are large and showy, and of interesting structure, possessing a white, curved, hoodlike extension of the disk that bears the stamens. At a distance, a tree in flower suggests a mass of orchids.

The petals are salmon pink to crimson madder on the inside, and on the outside are white, tinged with yellow.

The fruits take eighteen months to ripen, and remain on the tree until a new crop is well on the way. A thin, woody shell covers the leathery skin of mature fruits, within which is a juicy pulp. Though the pulp has a disagreeable odor suggesting decay, the natives are said to use it, when fresh, to make a cooling drink. A single tree has been planted at Fort Meyers, Fla.

Scientific Name. The scientific name of the cannon-ball tree is *Couroupita guianensis*. It is related to the Brazil nut (which see).

CANOE AND CANOEING. A canoe is a long, narrow boat, of light weight, designed to be propelled through the water by paddles.



ON NORTHERN STREAMS

Canoes are made in many sizes and patterns, each of which is best for a certain purpose. A canoe, for example, which will ride easily through river rapids may be too heavy and slow for use in quiet lagoons and lakes. For all ordinary purposes, however, a fourteen-foot canoe, with a two-foot beam, is very serviceable. Its weight should be as little as possible, the average being from forty to sixty pounds. One advantage of a light canoe is that it may be easily carried by one man from a lake or stream across a stretch of land to another watercourse.

The Art of Canoeing. Canoeing is a delightful pastime on rivers and lakes. With a skilful paddler at the stern, the light little craft can be sent skimming over the water, through rapids, across placid lakes, and down narrow streams into regions which could not easily be explored otherwise. But the art of canoeing cannot be mastered in a day, for it takes much practice to become a skilful paddler. While a canoe is very light, and responds immediately to the slightest touch of the paddle in water, this responsiveness makes canoeing difficult, for a poor paddler will have trouble in keeping his course, even in smooth water. A canoe is easily upset, as it is usually flat-bottomed and has no keel.

Special canoes, which are so made that a sail can be hoisted in the bow, often have a detachable or collapsible keel. Even with a keel, however, a canoe requires careful management.

Getting In and Out of a Canoe. The first step in canoeing is to learn how to get in and out. It is always safest to get in over the end, at bow or stern; a heavy weight suddenly thrown on the side of a canoe is almost sure to upset it. If it is impossible for any reason to get in over the ends, a step over the sides directly into the bottom is reasonably safe, especially if there is another person to help keep its balance.

How to Paddle. The best place for the paddler is at the stern, facing the bow, where the force of his stroke not only drives the boat forward but steers it. The paddle may be driven into the water on either side of the canoe, first



A "DUGOUT"

Eastern American style, hollowed out of a log.

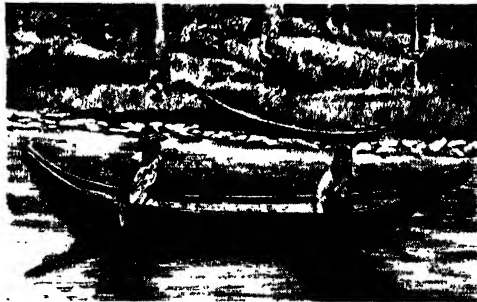
on one side, then on the other. If there is a second paddler in the canoe, he or she should sit in the bow, and the bow paddle should be on the left side when the stern paddle is on the right. If the paddle is dipped in on the right side, the right hand should grip the paddle lightly near the blade, and guide it into the water. The left hand should hold the handle firmly and should supply the force of the drive. The blade should enter the water without a splash, close to the canoe, and with the flat side at right angles to it. As the paddle is drawn back through the water, the blade should approach the stern until finally the flat side of the blade is parallel to the course of the canoe.

When the paddle has reached this point, it acts as a rudder, and a slight turn of the wrist to the right or left will turn the boat in the opposite direction. Steering is perhaps the most difficult part of canoeing, especially in rough water. In smooth water a long, steady stroke is easiest, but in rough water a short, quick one is usually best: it will keep the canoe in its course, whereas a slow stroke would give the wind time to turn its bow around between strokes.

Distribution of Weight. A canoe offers least resistance to the water if all the weight is in the stern. The bow is then high in the water or even out of water, and the canoe barely skims the surface. This plan is good on a calm day, but if there is any wind blowing, a sudden gust may turn the bow around in spite of everything the paddler in the stern can do. If a heavy sea is running, the weight should be evenly distributed, so that the bow and the stern are equally low in the water.

Kinds of Canoes. Primitive. The earliest canoes were made by tying together thin strips of wood and stretching a skin over them; the result looked like an umbrella upside down. Later, several skins were used, sewed together with sinews, and only one small opening was left for the paddler. Another of the early canoes was the hollowed-out tree trunk, called a *dugout*, still common in the interior of Africa. A variety of canoes were used in early days, and even to-day the Eskimos use the bone-frame and skin-covered craft. The poorer tribes of Indians of the United States and Canada cling to the birch-bark canoe; however, most of the Indians use the modern cedar boat.

Modern. The best modern canoes have cedar frames, covered with a heavy canvas. The ordinary canoe is open or undecked. Sailing canoes usually have a fore- and after-deck.



BRITISH COLUMBIA CEDAR DUGOUT

Some of the early boats of this character were a hundred feet long.

leaving only a well in the middle of the boat for the sailor or canoeist. Such canoes have water-tight compartments in the bow and stern, and collapsible center boards for use when the sail is up. In small canoes, the space below decks is wasted, but in larger ones it often provides sleeping quarters.

Motor Attachments. It is now possible to buy an adjustable motor and propeller which can be fastened to the stern of a canoe or rowboat in a few minutes. Such motor attachments are made under various trade names, and they are called outboard motors. They consist of a small gasoline engine which operates a marine-type propeller, and usually weigh from sixty to one hundred pounds.

CANONIZATION, *kan un i za' shun*, in the Roman Catholic Church, an impressive ceremony by which duly qualified deceased persons are declared saints. One of the necessary qualifications is the candidate's performance of at least two miracles. The power to canonize is vested in the Pope, who conducts a rigid investigation into the mode of life and into the genuineness of the miracles attributed to the prospective saint. This examination is a step toward canonization, which takes place many years after beatification, or announcement that the person is one of the "blessed." The object of the further delay is to allow sufficient time to collect additional proof of the fitness of the candidate. This being established, a day (usually the anniversary of the death of the new saint) is set aside on which to honor his memory, his name is placed in the list of the saints, and churches and altars are consecrated to him. G.W.M.

CANON, *kan' un*, **LAW**, a body of ecclesiastical law which regulates many of the doctrines and other affairs of the Roman Catholic Church. It is drawn from the opinions of the ancient fathers of the Church, the epistles and bulls of Popes, and the decrees of councils, to which are added certain maxims of the civil law and the teachings of the Bible.

CANON OF THE SCRIPTURES. See **BIBLE** (The Canon).

CANONSBURG, PA. See **PENNSYLVANIA** (back of map).

CANOPUS, *ka no' pus*. See **ASTRONOMY** (The Stars and Their Names); **CENTAURUS**.

CANOSSA. See **GREGORY** (VII).

CANOVA, *ka no' vah*, **ANTONIO** (1757-1822), one of the greatest Italian sculptors of his time, whose special work was to bring new life to the declining art of sculpture in Italy. At the Academy of Venice he had a brilliant career, and in 1779 he was sent by the senate of Venice to Rome, where he produced his *Theseus Vanquishing the Minotaur*. In 1783 Canova undertook the execution of the tomb of Pope Clement XIV in the Church of the Apostles, a work inferior to his second and perhaps his best public monument, the tomb of Pope Clement XIII in Saint Peter's.

He was summoned to Paris three times by Napoleon, and in 1812 he completed a colossal marble statue of the emperor, who is represented as a god. Canova's influence on the art of his time gives him a permanent place among great sculptors. When he began his work, Italian sculpture, having departed a long way from the strength, beauty, and idealism of Michelangelo, was weak and affected; Canova brought it back to the lofty standards of the Renaissance.

Other Examples of His Art. *Psyche and Butterfly*, *Hebe*, the colossal *Hercules Hurling Lichas into the Sea*, the *Pugilists*, and the group *Cupid and Psyche*

are among his more noted works. He executed in Rome his *Perseus with the Head of Medusa*.

CANSO, **STRAIT OF**. See **SAINT LAWRENCE**, **GULF OF**; **CAPE BRETON ISLAND**.

CANTABRIAN, *kan ta' bri an*, **SEA**. See **BISCAY**, **BAY OF**; **CAPE BRETON ISLAND**.

CANTALOUPE, *kan' ta lope*, a favorite variety of muskmelon (which see).

CANTATA, *kan tah' tah*, a story set to music, sung by a chorus and including solos, duets, trios, and quartets. The cantata is a shorter composition than the oratorio or opera. It differs further from the oratorio in that the latter always has a sacred theme; the cantata may be based upon any subject, religious or secular. However, there is little difference between a short oratorio and a religious cantata, and the great church cantatas of Bach are sometimes classed as oratorios. The opera is more elaborate than the cantata, and is further distinguished from it in being presented with scenery and by means of acting.

Dudley Buck (which see) was one of the greatest American composers of cantatas, among his best-known works being *The Golden Legend*, *Light of Asia*, *Voyage of Columbus*, and the melodious *King Olaf's Christmas*. Lewis Carroll's charming nonsense verses, *The Walrus and the Carpenter*, have been set to music by an English composer, Percy F. Fletcher, forming a cantata that is a favorite with children. Other well-known cantatas include *Queen Esther*, *The Rose Maiden*, and *From Olivet to Calvary*.

Related Subjects. The reader is referred in these volumes to the following articles.

Buck, Dudley	Opera
Music	Oratorio

CANTEEN. See **POST EXCHANGE**.

CANTERBURY, **ENGLAND**. See **ENGLAND** (The Cities); **CATHEDRAL**.

CANTERBURY TALES, the great production of the first renowned English poet, Geoffrey Chaucer (which see). His plan for this work was most ambitious, and although he died before he had carried it to completion, there remains enough to give it a place as one of the remarkable works of English literature. In the delightful *Prologue*, known to every high-school student, there is described a company of men and women who are about to set out on a pilgrimage to the shrine of Thomas à Becket. These are of every rank of life, and Chaucer showed himself in his descriptions of them a master character-painter. To while away the time on the journey, they plan to tell stories, each person to contribute two. These romantic tales, most of which are in verse, are now little read except by students of early English poetry, but the *Prologue* repays study by any person. It is a little difficult to read, for the spelling is different from that of to-day, but editions with notes are many and inexpensive, and the diffi-

culty soon passes with practice. The following quotations, which are very well known, need no interpreter:

He was a veray parfit gentil knight.

And gladly wolde he lerne, and gladly teche.

CANTICLES, *kan' ti k'lz*. See SOLOMON'S SONG.

CANTILEVER, *kan' ti le vur*, **BRIDGE**. See BRIDGE, subhead.

CANTON, *kan' ton*, the name of a political division in some countries of Europe, derived from the Italian *cantone*, meaning a *corner* or *angle*. In Switzerland each of the twenty-two states comprising the Swiss republic is known as a canton (see SWITZERLAND). The French canton is a division of the political unit known as *arrondissement*, and is the seat of a justice of the peace. There are 3,024 cantons in France, each consisting of an average of twelve *communes*, but some of the largest communes are divided into cantons. See FRANCE; COMMUNE.

CANTON', CHINA, a very important commercial center of the Orient, a city of great antiquity, and until the middle of the nineteenth century entirely removed from the influences of modern civilization. The actual population is not known; it is estimated as about 812,000. Like all Eastern seaports, it is divided into two parts—an old city, distinctly Oriental, harboring all the manners, customs, and prejudices of the East, and a modern part, devoted to commerce and forming a neutral territory on which East and West meet to trade. The city is admirably situated on the eastern bank of the Pearl River, eighty miles from the sea, in the province of Kwang-Tung. The ancient part is surrounded by a fortified wall six miles in circumference, with twelve gates for traffic. These gates are shut at night and carefully guarded. Two water gates protect the river east and west of the city. The river is the only home of many thousands of the inhabitants, who occupy boats and rafts moored to the banks. See page 1178.

According to Western ideas, the term "clean" can be applied to very few Asiatic cities, but Canton almost deserves that description. The streets of the old city are narrow, with houses of only two stories, the ground floor generally being a store or warehouse. The assortment of merchandise found in these unpretentious stores is almost endless. The products of every quarter of the globe are here collected, modern inventions from the West lying by the side of Eastern curiosities thousands of years old.

The new city is cosmopolitan. Chinese merchants have assimilated Western ideas and are expert, courteous, and industrious. While the old city retains its pagodas, mosques, and temples, the new quarter contains churches, libraries, schools, and business premises of the most modern architecture. The Canton Chris-

tian College possesses about fifty buildings on a site of 350 acres, and has a Women's Department, opened in 1913, a College of Arts and Science (1915), and of Agriculture (1921). The officials of the city and province reside in the old town; representatives of foreign countries and their staffs occupy a special quarter of the new city outside the walls.

The industries of Canton are varied, embracing the manufacture of silks, cotton goods, porcelain, glass, paper, sugar, lacquered ware, firecrackers, and metal goods. Until the close of the seventeenth century, commerce with China was carried on under great difficulties. All foreigners were "barbarians" or "devils," to be kept out of the country at all cost. The Chinese War of 1840 nominally threw open the port of Canton (one of the first to admit foreign trade), but it was not until 1861 that the port and city became actually open to foreigners. For many years Canton held a monopoly of the tea trade with England, but it suffered the loss of a great portion of this on the opening of other Chinese ports in 1860, and is now exceeded in importance as a tea center by Shanghai and Hong Kong. In 1925 work on harbor improvements was completed.

In 1923 Canton became the capital of Sun Yat Sen's new South China Republic. By 1927 the armies of the new government had gained control of all Southeastern China, and had put the Canton government under suspicion of the Western world because it had fallen under Russian bolshevist influence. See CHINA (History).

CAN'TON, ILL. See ILLINOIS (back of map).

CANTON, OHIO, the county seat of Stark County, is situated in the northeastern part of the state, on Nimishillen Creek. Massillon is eight miles west, Cleveland is fifty-nine miles north and west, and Pittsburgh is 101 miles southeast. The town was settled in 1805, was incorporated as a village in 1822, and chartered as a city in 1854. Population, 1930, 105,524 (Federal census). The foreign element, in which Austrians predominate, is comparatively small.

Canton was the home of William McKinley, twenty-fourth President of the United States. His home, now used as a hospital annex; the imposing tomb of the martyred President, and two monuments erected to the heroes of the Spanish-American War are features of interest in the city.

Transportation. The Pennsylvania, the Baltimore & Ohio, and the Wheeling & Lake Erie railways meet here, and interurban and motorbus lines operate from the city.

Industries. The city is noted for the variety of its industries. Its 300 or more factories produce 1,500 different articles, among which steel products predominate; safes and vaults, suction sweepers, metal furniture, farm implements, bridges, and watches be-



Photo. U & U

In Crowded Canton. Practically half a million people of this city live on river boats moored along the banks of the stream. Entire families live and die on board these boats, seldom spending a night on shore

long to this class. Rich deposits of clay, shale, and limestone are utilized in the manufacture of brick, tile, chinaware, and enamelware. The shipping of coal and grain from the vicinity is an important industry.

Institutions. Canton has the second largest Bible school in the world, enrolling 6,000 persons. The city has nine parks. D.L.H.

CANUTE, *ka nute'* (about 994-1035), a king of England, Denmark, and Norway with whose name there is associated a beautiful medieval legend. According to it, the great king, wearied of the flattery of his courtiers, who would have him believe they thought him to be divine, determined to give them a lesson. He had his throne placed near the seashore just before time for high water, and as the tide came up he commanded it in stern tones to go back. Then turning to his amazed courtiers, he told them to cease to call divine a king whose word had no power over the water at his feet.

Canute was not always such a devout man, for when he became king of England in 1014, on the death of his father, Sweyn, he began his reign by devastating the country and putting out of his way all who opposed him. Not until 1017 was he accepted as king by the whole island, and thereafter his character changed, for he ruled wisely and humanely, restoring old English customs and giving important posts to worthy English subjects. At the death of his brother in 1018, he gained Denmark, two years later conquered Norway, and in 1031 forced Malcolm of Scotland to acknowledge his supremacy. See ENGLAND (History).

CANVAS, a strong, coarse cloth, originally made of hemp, as shown by the name, which is derived from the Latin *cannabis*, meaning *hemp*. Ordinary canvas is now made from cotton, though better grades are made of flax.

The best grades, light and thin, are favorite materials for men's and women's summer clothing; these are called by the trade name of *duck*. Duck is usually made of linen, as also are certain heavier grades which are used by artists for paintings. The cloth used by artists varies in thickness according to the size of the picture—the larger the picture, the heavier the cloth. Canvas is also used to a considerable extent for awnings, tents, tarpaulins, and sails, the heavy weight and close weave of the fabric making it almost waterproof.

The sail cloth used on large vessels is usually made of linen of a good quality, as it is subject to hard wear, but smaller sails are most frequently made of cotton or of mixed goods.

CANVASBACK, a large fresh-water duck, native of North America, which is highly prized for food on account of its delicate flavor. It breeds in the northern parts of the United States and northward, and in the winter migrates to the valley of the Mississippi and the marshy lands of the Atlantic coast. Its food

consists chiefly of the roots of the wild celery, and wherever that plant is plentiful, the canvasback, if unmolested, may be found. Its plumage is black, white, chestnut-brown, and slate color. The *redhead duck* is often substituted for the canvasback on the market, owing to similarity of color, especially on the head. The canvasback was being hunted to extinction before the passage of protective game laws. See DUCK. D.L.

Scientific Name. The canvasback belongs to the family *Anatidae*. Its scientific name is *Aythya vallisneria*.

CANYON, OR CAÑON, *kan' yun*, a deep, narrow river valley or gorge with steep sides which in some instances are nearly perpendicular. Canyons are worn to their great depths by the erosion of thousands of years. Canyons form some of the grandest and most awe-inspiring scenery in the world. The Grand Canyon of the Colorado in Arizona is in some places over a mile deep. Next in size is the Grand Canyon of the Yellowstone, in Yellowstone National Park. This canyon is 1,500 feet deep, and its walls are formed of rocks, colored red, brown, yellow, and gray. The Royal Gorge in Colorado is one of the most remarkable narrow gorges in the world. Its walls are perpendicular for almost its entire length. Many small canyons notable for their beauty occur in the Canadian Rockies. R.H.W.

Further Information. The word *canyon* is from the Spanish *cañon*, meaning *funnel*. Investigation of this topic will not be complete without reference to the following articles

Erosion
Grand Canyon of the
Colorado

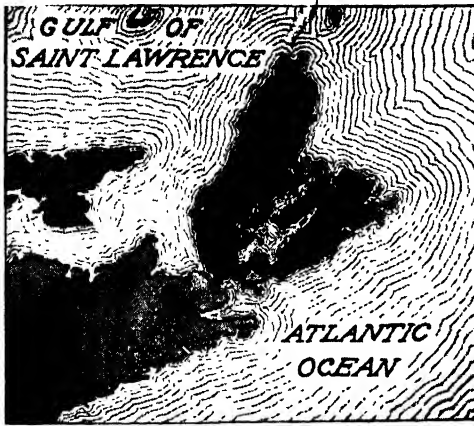
Royal Gorge
Yellowstone National
Park

CAOUTCHOUC, *koo' chook*, the name given to rubber outside of English-speaking countries. See RUBBER.

CAPE BRETON ISLAND, *bret' un*, or *bril' un*. This rocky, irregularly shaped island is part of the province of Nova Scotia (which see), and takes its name from a cape at the eastern end, a name which always reminded many of the good Acadian peasants of their distant home across the seas. Cape Breton Island is geologically a continuation of the Nova Scotia peninsula, and is separated from it only by the narrow Strait of Canso, which connects Saint George's Bay, to the north, with Chedabucto Bay, to the south.

Like the adjoining mainland, the island is noted for its forests, its mines, its fisheries, and its picturesque landscapes. The timber is locally valuable, but has long since become an insignificant factor in the Canadian supply. The coal fields, however, are among the most important in the whole Dominion. The important fields are three: the Sydney field, in the northeast, with the splendid harbor of Sydney

as its central point; the Inverness field, along the west shore of the island; and the Richmond field, just north of Chedabucto Bay. These fields are the largest contributors to the prov-



LOCATION MAP

ince's annual output of about 8,000,000 tons, more than half of the present total for the Dominion.

Next in importance to the industries dependent on coal and iron are the fisheries, which employ about 7,000 men and support about one-third of the population of the island. Cod, mackerel, herring, and whitefish are the big catches. There is little game fishing, but many tourists are attracted to the island by its picturesque scenery and delightful summer weather.

Like the mainland of Nova Scotia, the island was originally a French possession. The English seized it in 1745, restored it to France three years later, recaptured it in 1758, and finally gained permanent possession in 1763. At first it was a separate colony, but later was united with Nova Scotia.

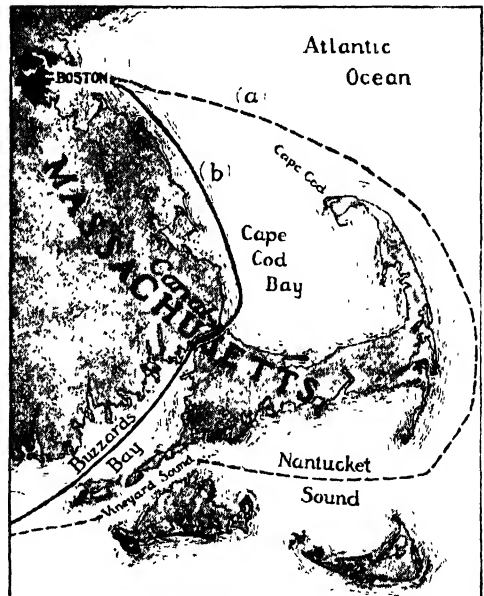
It has an area of 3,120 square miles and is practically divided from north to south into two separate parts by the chain of Bras d'Or Lakes and the canal on Saint Peter's Isthmus. The principal towns are Sydney, having a population of about 23,000, Dominion, Sydney Mines, North Sydney, Glace Bay, and Inverness. Louisburg, once a great fortress and the most important point on the island, is now an incorporated town. The total population of the island, including a few hundred Indians, was 131,495 in 1921. Most of the people are descendants of Scotch Highlanders. G.H.L.

CAPE BUFFALO. See **BUFFALO.**

CAPE COD CANAL, a sea-level waterway without locks, built across the narrow strip of land where Cape Cod joins the Massachusetts mainland, was opened to navigation in 1914. It connects Buzzard's Bay with Barnstable

Bay, an extension of Cape Cod Bay, at Sandwich, Mass., and from shore to shore is eight miles in length. The total length of the channel, however, excavated from a thirty-foot depth in either bay, is thirteen miles. The canal has a uniform depth of twenty-five feet at average low water, and, with the exception of one bend, runs straight across the Cape. The approaches in both bays are from 250 to 350 feet wide at the bottom. To protect the entrance on the Cape Cod Bay side, a massive breakwater 3,000 feet long was built, and a lighthouse was constructed on the end of this breakwater. The canal throughout the greater part of the course is 100 feet wide at the bottom, but there are three passing points where it increases to 250 feet. It is illuminated throughout its course by electricity, according to a street-lighting plan, and is crossed by modern railway and highway bridges. The expense of operation is met by tolls.

The Cape Cod Canal means a saving of seventy miles of distance for vessels engaged in the carrying trade between Boston and New York and Southern ports. Previous to the opening of the canal, ships carrying an average of 25,000,000 tons of freight a year were



CAPE COD CANAL

(a) Route before opening of canal; (b) present route, through canal.

forced to make the trip between Boston and New York around the Cape by way of Nantucket Sound, a distance of 334 miles, as against 264 miles by way of the canal. The former route is difficult and dangerous be-

cause of the shoals in the Sound, the frequent fogs that obscure the signals from the lighthouse, and the reefs on the shores of the Cape. Since the year 1843 over 2,100 vessels have been wrecked in the region of the Nantucket shoals, and about 700 persons lost their lives. The construction of the canal has therefore meant a saving of lives and property as well as of time and distance.

History. The agitation for such a canal was not a recent movement, for the project was considered as early as 1697. During the War of the American Revolution, General Washington, finding it impossible to send his troops to New York over a sea route, said, "The interior barrier (across Cape Cod) should be cut in order to give greater security to navigation and against the enemy." The route was first surveyed in 1791, and several companies were formed to build the canal before its construction was made a possibility by the decision of Mr. August Belmont to finance the undertaking. Work was begun in 1909, and the canal was completed in 1914, the cost of construction amounting to \$12,000,000. In 1928 the canal became the property of the United States government, by purchase.

CAPE DIAMOND. See QUEBEC (City).

CAPE FEAR RIVER. See NORTH CAROLINA (Rivers and Lakes).

CAPE GIRARDEAU, *ji rahr' doh*, Mo., See MISSOURI (back of map).

CAPE HORN ROCK. See OREGON.

CAPE JASMINE, *jas' min*. See GARDENIA.

CAPELLA, the brightest star in the constellation Auriga (which see). See, also, ASTRONOMY (The Stars and Their Names).

CAPE OF GOOD HOPE, PROVINCE OF THE, the oldest of the federated provinces now forming the Union of South Africa (which see).

CAPER, *ka' pur*, the unopened flower bud of the caper bush, which, pickled in vinegar and salt, is widely used in making a sauce for meats, especially boiled mutton. The sharp, biting taste of the caper is not usually pleasing when first tried, but, like that of the olive, becomes palatable on further acquaintance. The caper bush is a low, trailing shrub, native to the countries bordering on the Mediterranean Sea, where it climbs over walls and in and out of crevices. It is grown from cuttings in greenhouses



CAPER
Flower, bud, and leaves.

Northern United States, and Canada, and from seed in the Southern United States. The plant begins to bloom early in the summer, and the flowers appear until winter. The buds are gathered each morning, placed at once in salt and vinegar, and later put on the market, the finer specimens in bottles, the coarser in small barrels. The flower buds of the marsh marigold and nasturtium are often pickled and eaten as a substitute for capers. **B.M.D.**

Scientific Name. The caper bush belongs to the family *Capparidaceae*. Its botanical name is *Capparis spinosa*.

CAPETIAN, *ka pe' shan*, **DYNASTY**, a famous line of French kings, which took its name from the first of the house, Hugh Capet (which see). These kings ruled from 987 to 1328, and in nearly every case throughout this period, son followed father in regular succession. Under the Capetians, the French monarchy grew steadily in power and influence, and the greater part of the English domain in France was recovered from England and added to the French possessions. This was also the period of the Crusades, three Capetian kings being themselves at the head of crusading armies. The most important political event of the period was the admission of representatives of the common people, known as the Third Estate, to the National Assembly, which occurred in 1302, during the reign of Philip the Fair. The last Capetian king, Charles IV, was succeeded in 1328 by Philip VI, of the House of Valois (which see).

CAPE-TO-CAIRO, *ki' ro*, **RAILWAY**, a trunk line of railway through the entire continent of Africa, from Cairo and Alexandria to Cape Town. The project was first considered by Cecil Rhodes with a view to opening up the vast resources of the continent, and was first undertaken as a private enterprise. It was intended to push the line from both ends, running south from Cairo and north from Cape Town, the two ends to meet somewhere in the vicinity of the great Central African lakes. The total length is about 5,700 miles, making it the longest continuous line in the world.

In 1889 the first rails were laid at Kimberley, that town already having rail connection with Cape Town. Through Rhodesia the roadbed was quickly constructed, little ballasting being necessary. At one time the construction was so rapid that 492 miles of track were laid in 500 working days. In 1925 only 300 miles remained to accomplish the project; the vast program was completed in 1926. While only a few years ago the crossing of Africa was considered an impossibility, to-day, by means of the Cape-to-Cairo Railway, it may be accomplished in about one month. This length of time is required, for included in the project is much water navigation.

Difficulties Experienced. It was not until the banks of the Zambezi River were approached that serious engineering problems presented themselves. The crossing of the

the climate, the work was pushed on, and plans were matured for its completion. During the early stages of construction, the opposition of the natives was a serious detriment in the face of the need of labor.

The Northern Portion. The Egyptian government undertook the construction of the line from Cairo southward. In 1896 work was projected southward from Wadi Halfa, the point to which the line had been brought by the khedive of Egypt. About 1,400 miles of track have been laid. At Athara, the line crosses the River Nile by means of a steel bridge 1,000 feet in length.

The Southern Portion. From Cape Town the railroad takes a northeasterly course to Bukama, in Belgian Congo, where steamer transportation along the Leralaba River is necessary. From Kababo it continues to Albertville. From this point onward to Wadi Halfa, the course is broken by short stretches of water transportation, alternating with rail. The complete plan provides for an all-rail route which some day shall entirely eliminate water transportation.

Objects of the Railway. The railway forms the main artery of continental communication, with branches extending east and west. Thus, the products of the interior now find ready outlet to the coast, colonization is accelerated, and regions now uninhabitable will in due time be turned into productive, healthful provinces.

That part of Africa which is already settled forms a very small portion of the whole continent, and the railroad is opening up territory capable of absorbing a great proportion of the surplus population of European countries.

CAPE TOWN, the capital of the Cape of Good Hope Province, in the Union of South Africa, and the seat of the Parliament of the Union (the administration headquarters is at Pretoria). It is beautifully situated on the lower slopes of Table Mountain, overlooking Table Bay, on the South Atlantic Ocean, less than a hundred miles northwest of Cape Agulhas, the southernmost point of the African continent. It is a city of many attractions; the houses and public buildings are in modern European style, with the exception of a few typical old Dutch dwellings, reminders of the days before the great "trek," when the Dutch emigrated farther north to establish themselves independently. The streets are gay with a mass of color, Malays, Hindus, Zulus, Kaffirs, and whites mingling in the crowded thoroughfares. The harbor is excellent and is protected by a breakwater over 4,000 feet long, and the docks cover a large acreage. Its commerce is very extensive, as it is one of the principal gateways to South Africa and is the depot of supplies for a vast territory. Railroad connections are good with all parts of the Union.



CAPE-TO-CAIRO RAILROAD

Zambezi River was made by means of a cantilever bridge with a clear span of 500 feet across the gorge immediately below the Victoria Falls. This bridge, the highest in the world, 420 feet above the water, was completed in eighteen months. See VICTORIA FALLS.

Farther north, the difficulties increased, and the fever-stricken districts through which the line passed rendered the task of construction one of great difficulty and danger. In spite of the difficulty of obtaining a sufficient number of competent white men who could withstand

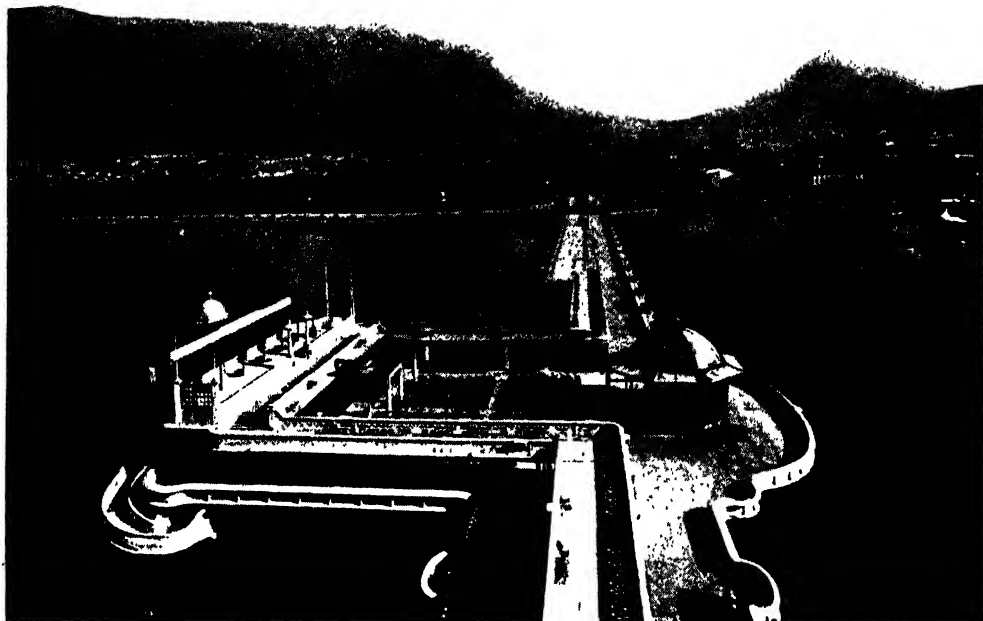


Photo Herbert

A SPOT OF BEAUTY NEAR AFRICA'S SOUTHERN TIP

The above scene is at Cape Town. The structure in the foreground is a breakwater promenade, which has an open-air band pavilion. In the far distance are the famous Table Mountain and the Lion Head peak.

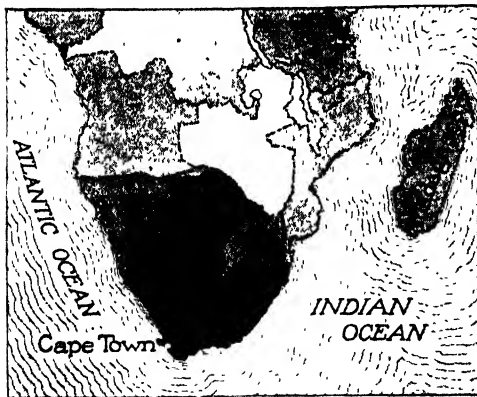
The city has numerous parks and gardens, noted for their beautiful flowers and trees and many fine buildings, among which are the Houses of Parliament, the Supreme Court, the

healthful, though dust storms are frequent and sometimes serious. The suburbs are noted for their beauty, and the surrounding country is fertile and rich in natural resources. The population (white), in 1926, was 130,260. See UNION OF SOUTH AFRICA.

CAPE VERDE, *vurd*, ISLANDS, a group of ten volcanic islands and four islets in the Atlantic Ocean west of Africa, belonging to Portugal, and named after Cape Verde, on the African coast. Their area is 1,480 square miles. The islands produce rice, maize, coffee, tobacco, sugar cane, nuts, and fruits. Most of the inhabitants are negroes or of mixed race. The chief town is Praia, a seaport on Santiago, the largest island; from here the government is administered. Porto Grande, on São Vicente, is a coaling station for steamers and has the best harbor in the group. Until 1854 slavery was a settled institution, and it was not until 1876 that all slaves were declared free. Population, about 150,000.

CAPE HAITI, OR CAP HAITIEN, *kap ha-ti en'*, a town in Haiti (which see).

CAPILLARIES, *kap' i la riz*. When you prick through your skin with the point of even the finest needle, blood oozes out. This is because the needle has entered a minute blood vessel. These small blood vessels are the capillaries, and they connect the arteries with the veins. Some of them are so small that only one blood corpuscle at a time can pass through.



LOCATION MAP

Area in black shows the Province of the Cape of Good Hope and Natal. Cape Town is shown in the southwest. (a) German Southwest Africa, captured by the British in 1915, now called Southwest Africa; (b) Bechuanaland Protectorate; (c) Transvaal; (d) Orange Free State; (e) Basutoland.

Museum, a cathedral, and some remarkable mosques. The Cape Observatory, one of the most important astronomical institutions in the world, is situated here. The climate is

They are largest in the skin and the marrow of the bones, and smallest in the brain and the mucous membrane of the intestines. The capillaries are distributed all through the body, and in the skin they form a complete network.

The walls of the capillaries are very thin, and the nutritive material in the blood passes through them into the tissues. The waste matter is also absorbed through them into the blood. In the capillaries of the lungs, the blood receives oxygen and gives off carbon dioxide. K.A.E.

Related Subjects. For additional information on the subject, the reader is referred in these volumes to the following articles:

Arteries Blood Lungs Veins

CAPILLARITY, *kap i lair' i tie*. If you drop ink on your paper, and hold the corner of a piece of blotting paper in it, the ink will rise into the blotter; or if you touch the ink with a stick of chalk, the crayon will absorb the ink. Again, if you take a number of straws of

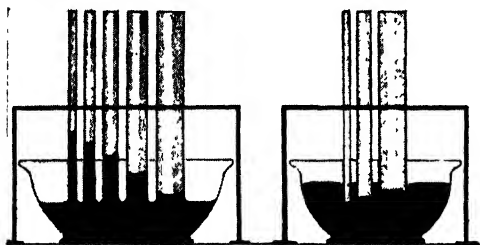


FIG. 1

FIG. 2

different sizes and place them in a glass of water, the water will rise in the straws above the surface of the water in the glass (see Fig. 1). If a little red ink is added to the water, its height in the straws is more easily seen. This tendency of liquids to rise in small tubes and into the hairlike pores of porous bodies is called *capillarity*; the word is from *capillary*, which means *hairlike*.

There are many illustrations of capillarity in nature. By it, water is drawn upward in soil, the small spaces between particles of earth acting as capillary tubes; wood absorbs moisture and thereby swells; and the capillaries of the blood vessels carry the blood to every part of the body. We also make use of capillarity in various ways. It is capillarity that draws up the oil in lamp wicks, and that causes water to enter the pores of sugar and other substances in the process of dissolving. In all these cases, adhesion is greater than cohesion, but if cohesion is greater than adhesion—that is, if the attractive force of the molecules of a liquid for one another is greater than the attractive force of the molecules of the liquid for those of the solid—the level of the liquid in capillary tubes is lower than on the outside. Mercury is such a liquid, and when

capillary tubes are placed in it the mercury will be depressed in the tubes, and its surface will be convex (see Fig. 2). In general, a liquid rises in small tubes when it wets the tubes, and is depressed when it does not wet them. See ADHESION; COHESION. A.L.F.

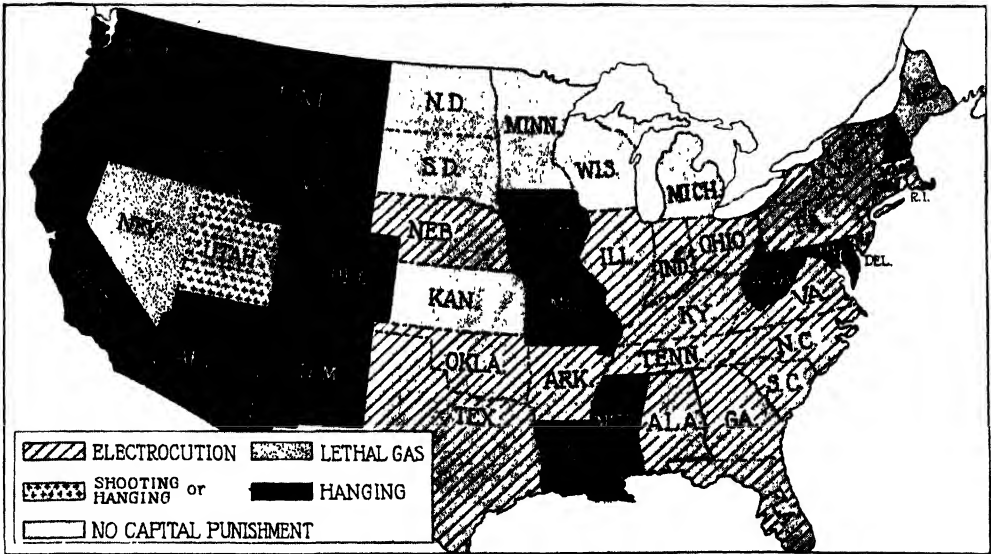
CAPITAL, in architecture. See COLUMN.

CAPITAL, in economics, is wealth, other than land, used or intended to be used to produce more wealth (see WEALTH). It includes such things as raw materials, factories, machines and tools, railways and ships, and finished goods of all kinds in warehouses and on the shelves of retailers. The term is not as broad as wealth; for only that part of wealth that is used (or intended to be used) to produce more wealth is capital. The clothes that we wear, the furniture in our homes, and the food on our table are not capital; they are wealth, but since they are not used to produce more wealth, they are not reckoned as capital.

Capital plays a fundamental part in our present industrial system. The world has never known a time when the abundance and variety of goods were as great as they are now. This fortunate condition is due largely to the possession of a vast mass of capital, especially in the form of fixed capital, such as factories, machines, tools, and efficient means of transportation and communication. It takes a long time, often years, to provide some forms of capital, such as railways, electric-light and power plants with their turbo-generators, and canals. Yet once the capital has been provided, the effectiveness of industry is enormously increased.

Some persons have expressed themselves as favoring the abolition of capitalism. What they usually have in mind is the abolition of the private ownership of capital—of the means of production (upon this subject the reader is referred to the discussion in these volumes on SOCIALISM); but certainly the abolition of capital, as such, is not to be considered, even for a moment. Practically no one, no matter how he talks, would voluntarily go back to the time when capital was very scarce, let alone practically non-existent. We are too accustomed nowadays to an abundant supply of consumable goods to be willing to return to the earlier conditions when even kings and princes knew not the pleasures of the automobile. And these consumable goods are abundant only because of the vast mass of capital that is employed in their production.

How has the vast accumulation of capital characteristic of the present day come into existence? It has been created by labor, with the aid of capital and land, but an indispensable condition has been the saving of money means. In the earlier days of capital creation, a worker who had saved up consumption goods was free to turn his energies to the fashioning of tools.



HOW THE STATES INFLICT PENALTIES FOR MURDER

He thereby created capital, and by adding to the productivity of his labor, was enabled to accumulate a greater surplus of consumption goods, which left him even more time for the creation of additional capital. Thus the process continued, though at a comparatively slow rate until the industrial revolution in the last half of the eighteenth century tremendously accelerated the movement. The greater the accumulation of capital, the easier the further creation of capital. Indispensable to the process of capital creation, as it is now carried on, is the saving of money means. Persons in the receipt of incomes save a portion thereof by spending less than they receive. These savings may be put in a bank, invested in bonds or stock or real-estate mortgages, and the like. By one process or another, they usually are made available to governments, corporations, and individuals, who employ them in the further creation of capital. A large part of the savings nowadays is made by the corporations themselves, which withhold a portion of the profits from the stockholders and reinvest it in the business. To induce savings to be made, a premium has to be paid, of course, to the savers. Thus arise problems of interest and profits.

Not only does the creation of capital involve labor and saving, but its maintenance does also. The capital that was created in the past is eventually consumed. Portions of the capital—cotton and wool, for example—are quickly consumed in the act of producing cotton and woollen cloth; and other portions—factories and ships, for example—last a long time. But all forms of capital wear out

sooner or later. It is necessary, therefore, not only to create new capital, but to keep intact the capital we already have. Here, again, we see the necessity of permitting an adequate return to those who take upon themselves the necessary task of maintaining and increasing our supply of capital. E.J.

Related Subjects. Closely associated with this topic are the following, to which the reader is directed:

Interest	Socialism
Mill, John Stuart	Stock, Capital
Rent	Trust
Single Tax	Wages

CAPITALISM. See CAPITAL.

CAPITALIZATION, the use of capital letters. See SENTENCE, subhead.

CAPITAL PUNISHMENT, the severest punishment that can be prescribed by the courts—that of death. The word *capital* means *pertaining to the head*, and was applied to criminal law from the fact that beheading was the early form of execution. The manner of inflicting the death penalty has greatly varied; the methods of olden times were often barbarous and cruel, but public sentiment in modern days discountenances any but the most humane means for the infliction of this penalty.

Capital-Punishment Offenses. In the United States, capital punishment is inflicted for murder and treason, and in military law for sedition, violence, gross neglect of duty, desertion, or disobedience in vital cases to lawful commands. Each state or province has jurisdiction over its own territory, and therefore the laws governing crime differ. The court before which the trial is held pronounces the death sentence, but in many jurisdictions the laws require a warrant from the chief executive before the

execution may take place. Since 1868 in England, all executions are required by law to take place privately, and this plan has also been adopted widely in the United States and Canada.

In Canada the death sentence may be imposed for treason, murder, rape, piracy with violence, and "upon subjects of a friendly power who levy war on the king in Canada."

How Penalties Are Enforced. Sentence of death is executed by hanging in most parts of the United States, Canada, Great Britain, Scotland, Ireland, Austria, and Japan. In France and Germany, the guillotine is the usual means of punishment; strangulation by the garrote is employed in Spain. In Nevada an act was passed in 1921 providing for the use of lethal gas in carrying out the death penalty. In Utah persons under the sentence of death may be shot by a firing squad, if they so desire, rather than meet death by hanging.

Electrocution. The method by electrocution was first adopted by the state of New York, becoming effective on January 1, 1889. Since that time nearly twenty states have adopted it; those that employ electrocution, according to official reports late in 1929, are indicated on the map, page 1185.

Where Death Penalty Is Abolished. Among the states of the Union, Michigan abolished the death penalty in 1846 except for treason, and Wisconsin wholly abolished it in 1853. Maine abolished it for the second time in 1887, and it has also been discontinued in Rhode Island, Minnesota, Kansas, North Dakota, South Dakota, and Connecticut, imprisonment for life being substituted as the most drastic penalty for murder in the first degree. In the European countries, Belgium has had no legal execution since 1863. Switzerland abolished capital punishment in 1874, and though the right of restoring it was given to each canton, or state, only seven out of the twenty-two exercised this power. Rumania abolished it in 1864, Holland in 1870, and Portugal has likewise discontinued it. Although abolished in Italy in 1888, capital punishment was restored in 1926 in case of attempts against the life of king, regent, queen, crown prince, or premier.

CAPITALS OF THE UNITED STATES. The national legislative body of the United States, since the Declaration of Independence, has met in session and passed laws in nine different cities. The Continental Congress, which passed the famous independence resolution of Richard Henry Lee and adopted the subsequent Declaration, sat in Philadelphia from September 5, 1774, to December, 1776. See **DECLARATION OF INDEPENDENCE**.

During the course of the Revolution, the dangerous proximity of the British troops made necessary frequent changes of headquarters for

the national governing body, and Congress met in the following cities:

Baltimore, Dec. 20, 1776, to Mar., 1777.
Philadelphia, Mar. 4, 1777, to Sept., 1777.
Lancaster, Pa., Sept. 27, 1777, to Sept. 30, 1777
York, Pa., Sept. 30, 1777, to July, 1778.
Philadelphia, July 2, 1778, to June 30, 1783.
Princeton, N. J., June 30, 1783, to Nov. 20, 1783
Annapolis, Md., Nov. 26, 1783, to Nov. 30, 1784
Trenton, N. J., Nov. 30, 1784, to Jan., 1785
New York, Jan. 11, 1785, to June, 1790.

For the next ten years, Philadelphia was the seat of government, but that city was regarded only as a temporary location, for the Constitution, drafted in 1787, authorized Congress to exercise exclusive legislation over some district, not exceeding 100 square miles, which should be ceded by particular states and be acceptable to Congress as the seat of government. President Washington was authorized by Congress to select a site; as he favored one somewhere on the Potomac, Maryland made a cession of 60½ square miles, and Virginia one of 30½ square miles, on opposite sides of the river (see **DISTRICT OF COLUMBIA**). The city of Washington, which was laid out on the Maryland side of the Potomac, became officially the national capital in 1800. The Virginia cession was subsequently returned to that state.

CAPITATION TAX, another name for poll tax (which see).

CAPITOL. Historically the name *capitol* is applied to the Capitoline Hill, the smallest and most famous of the seven hills on which Rome was built; sometimes the name is applied to the great temple of Jupiter, which stood on the southern of the two summits of the Capitoline. The northern summit was the site of the citadel of the ancient city. The temple to Jupiter, in which was carried on the worship of three great deities, Jupiter, Juno, and Minerva, was the center of the state religion. The edifice was begun by one of the legendary kings of Rome, and was later destroyed and rebuilt again and again, each time with greater magnificence. The final structure, that of Domitian, lasted until the tenth century. Other important structures on the Capitoline Hill were the temple of Jupiter Tonans (Jupiter of Thunder), erected by the Emperor Augustus, and the Tabularium, a magnificent library built in 73 B.C., for the housing of the public records. See the article **ROME**, for diagram of the ancient city.

[In its modern application, the word refers to a pretentious building in the seat of government of a country, province, or state, from which the government administers the laws. The *city* is thus the *capital city*; the *building* is the *capitol*.]

CAPITOLINE HILL. See **ROME** (Ancient).
CAPITULATION, *ka pit u la' shun*, **DAY**. See **ARMISTICE DAY**.



CAPORETTO, *kap o ret' o*, the scene of a decisive battle of the World War. See ITALY (History: Italy and the World War).

CAPRI, *kah pre'*, known in ancient times as *Capreae*, is a beautiful Italian island, in the Bay of Naples, celebrated for its delightful climate and invigorating air. It yearly attracts many thousands of tourists. The area is five and three-fourths square miles, and the highest elevation, Mount Solaro, rises 1,020 feet above the sea. [The islanders produce white and red wine, oil, and fruits.

The capital, Capri, is in the eastern portion; Anacapri, in the west, is built on a plateau 880 feet above the sea and is reached by a winding road cut through the rock. Population, about 6,800.

CAPRICORN, *kap' ri kawrn*, TROPIC OF. See ZONE; TROPICS.

CAPRICORNUS, *kap ri kawr' nus*, meaning THE GOAT, is applied to a constellation of the southern hemisphere and the tenth sign of the



LOVELY CAPRI AND THE BLUE GROTTO

One cannot exaggerate the beauty of this gem of the Bay of Naples, or over-praise the charm of the views from its hilltops. The deep-blue color of the sea, the mountains in the background, rising from Italy's curving shores, the brilliance of the sunny Italian skies, all create a picture of surpassing loveliness. In the illustration above is shown Marina Grande, the landing place of the island; below is the celebrated Blue Grotto, whose coloring has been likened to that of blue fire.

zodiac, marking the winter solstice, about December 22. The symbol of Capricornus is ♑, representing the horns of the animal, and it generally appears in art as a figure with the fore part of a goat and the hind part of a fish. According to tradition, the goat represents the god Pan, who had the head of a man with the legs of a goat. By some it is supposed to represent Amalthea, the goat that suckled the infant Hercules. *Capricorn* is the name of the southern tropic. See ZODIAC; TROPICS.

F.B.L.

CAPSICUM, *kap' si kum*.

the name of a genus of tropical plants, whose pungent, many-seeded pods, or fruits, are valuable for seasoning or medicinal purposes. The capsicums are shrubby plants, with wheel-shaped flowers and simple leaves. The fruits of different species are of various forms, ranging from round to heart-shaped. Cayenne, or red, pepper is made chiefly from the dried fruits of two species, *Capsicum annuum* and *C. frutescens*. Varieties of these are raised in



THE CARABAO AT WORK

Photos U & U

Awkward in movement, sluggish, yet docile under good treatment, the carabao is an invaluable beast in the rice fields. In the lower picture is a suggestion of lack of haste. Travel is slow, but it has elements of comfort for the native. The driver knows that his three animals will take their time on the road, so he provides himself with shelter from the sun.

gardens in temperate regions. Capsicum fruits are also widely used in making sauces and mixed pickles. Pimento is also a product of *C. annuum*. A favorite Hungarian condiment called *paprika* (which see) is the product of some of the less pungent forms. Some kinds are especially cultivated for medicinal uses, mainly as a counter-irritant. Dried or pulverized, these fruits are used in cases of neuralgia and rheumatism and as an ingredient of a gargle in extreme cases of sore throat.

Classification. The capsicums are placed by botanists in the family *Solanaceae*.



CAPSICUM

CAPSTAN. See WHEEL AND AXLE.

CAPTAIN, a commissioned officer in the army and navy, in rank next above a first lieutenant. In the army, a captain commands a company and is assisted by first and second lieutenants. In the navy, he commands a battleship. The naval officer takes rank one step above the military officers with the same title; hence a naval lieutenant is equal in rank to a military captain, and a naval captain is of the same rank as a military colonel. See RANK IN ARMY AND NAVY.

CAPTAIN KIDD. See KIDD, WILLIAM.

CAP TOURMENTE. See QUEBEC.

CAPUCHIN, *kap' u chin*. See SAPAJOU.

CAPUCHIN MONKEY. See MONKEY.

CAPUCHINS, *kap' u chinz*, or *kap u sheenz'*, an order of friars, founded in 1525, which is a branch of the Order of Saint Francis, the name being taken from the pointed hood, or *capuche*, which is a part of their habit. They are clothed in brown or gray, and wear sandals instead of shoes. The rules of the order prescribe that the members shall live by alms, and that no gold, silver, or silk shall be used about their altars. The Capuchins are characterized by their devout piety and simple sermons, and, with the Jesuits, they were the most effective preachers and missionaries of the Church in the sixteenth century. In the United States there are several of these monasteries. G.W.M.

CAPULIN MONUMENT, *kap' u lin*. See MONUMENTS, NATIONAL; NEW MEXICO.

CARABAO, *kah rah bah' o*, the name given to a variety of the Asiatic water buffalo found in the Philippine Islands, where it is domesticated and highly valued as a beast of

burden. It is very slow in its movements and will not work during the heat of the day, but will travel through bogs and marshes where no other animal could pass. Like its Indian relative, it loves the water, and is a good swimmer. In its wild state it is fearless, and if wounded it becomes dangerous, charging with great speed and ferocity. It is a little smaller than the Indian water buffalo, which is often six feet high at the shoulder. In color, the carabao is a slaty bluish-black, and it becomes almost hairless when aged.

The carabao dislikes white people, for it never has become accustomed to their odor, but it exhibits something bordering on affection for its native master. See BUFFALO, for classification.

W.N.H.

CARACALLA, *kair a kahr' ah*, BATHS OF. See BATHS AND BATHING.

CARACAS, *kah rah' kahs*, capital of Venezuela (which see).

CARAPACE, *kair' a pase*. See TURTLE; SHELL.

CARAT, *kair' at*, a weight used by jewelers in weighing precious stones and pearls. The term is derived from the Arabic *carat*, meaning a *bean* or *seed*. In ancient times the seeds of the coral and carob trees were used as weights for precious stones, which were described as being of so many "beans weight" or "carats." The new international carat weights 200 milligrams, and therefore is one-fifth of a gram. The term is also used to express the amount of gold in an alloy, or the ratio, a carat being $\frac{1}{24}$ of the total weight. So, if $\frac{14}{24}$ of an alloy is pure gold, it is said to be 18 carats fine, and when it is 24 carats fine it is pure, or *solid, gold*. See ALLOY; DIAMOND; GOLD.

CARAVAGGIO, *kah rah vah' jo*, MICHEL-ANGELO MERISI DA (1565-1600), a celebrated Italian painter, founder and leader of the naturalistic school of painting in Italy. The name Caravaggio, by which he is generally known, is the name of his birthplace. After studying in Milan and Venice, he went to Rome, where he made great progress in his art and became widely known as the painter who followed nature and disregarded tradition. His fiery temper and quarrelsome disposition proved a greater hindrance to him than the opposition of his rivals, and he was forced to leave Rome after killing a comrade in a brawl. Thereafter, he painted in Naples, in Malta, and in various cities of Sicily.

Estimate of His Work. Caravaggio was a pioneer in the movement for naturalness in painting, and his influence extended far beyond his native land. He painted two groups of pictures—scenes from everyday life and religious subjects. Of the former, good examples are his *Card Players*, *The Gipsy Fortune Teller*, and *Love Conquered*. The figures in his religious canvases are painted with such boldness

and realism that they were highly displeasing to the people of his time, who preferred idealistic treatment of the saints. His masterpiece, *The Burial of Christ*, now in the Vatican, is one of the great pictures of the world. Another well-known canvas is *The Supper at Emmaus*.

CARAVAN, a Persian word meaning *people* or *army*, is taken over into the English language to mean a very special group of people—one of the large companies which travel together across the deserts of Asia or Africa.



Photo. O. R. O. C.

A NORTHERN CARAVAN

Not all caravans cross the burning sands of the desert. This one is wending its way along a frozen highway in the middle of winter, near Peiping, China.

For the most part, these travelers are merchants who dare not set out alone for fear of robbers and the beasts of the desert, but there are also each year, at certain holy seasons, caravans of pilgrims who journey from Cairo or Damascus to Mecca (see MOHAMMEDANISM). Whatever the purpose, camels are used as the means of conveyance, for only camels among pack animals can travel for days or even weeks across the desert lands (see CAMEL).

Centuries ago, when the cities about the Eastern Mediterranean shores were the great trade centers of the world, immense caravans journeyed to them every year from more easterly parts of Asia, bringing the rugs and spices of Persia, the embroideries, tea, and silks of China, the jewels and shawls of India. Sometimes there were in one of these great trains from 1,000 to 5,000 camels. The caravan might thus be several miles in length, and the camping spots were like populous villages. Today, throughout much of the Orient, railways have made the old-time caravans unnecessary, but no railroad has as yet made its way into the interior of the deserts, to which the camel easily penetrates.

In Literature. The thought of these great caravans, moving noiselessly across the sands, without haste yet without rest, has always been fascinating to Western minds, and allusions to them in literature are numerous. Bryant in his *Thanatopsis* speaks of—

The innumerable caravan which moves
To that mysterious realm where each shall take
His chamber in the silent halls of death.

Milnes, with less figurative meaning, writes:

While o'er the neighboring bridge the caravan
Winds slowly in one line interminable
Of camel after camel.

CARAVEL, the name given to the type of ship used by Columbus on his first voyage across the Atlantic, and in general by the Spanish and Portuguese seamen of the fifteenth and sixteenth centuries to vessels undertaking long voyages. The caravel was a ship of 200



A CARAVEL

A reproduction of the *Pinta*, one of the three ships of Columbus on his first voyage to America.

or 300 tons, having a deep hull and high decks fore and aft, and carrying a double tower at the stern and a single one at the bow. The vessel had three masts. Faithful reproductions of the three ships of the fleet of Columbus, the *Nina*, *Pinta*, and *Santa Maria*, were constructed in Spain, towed to the United States, and exhibited at the World's Columbian Exposition in Chicago in 1893. Afterward they were for years an exhibit in the lagoons of Jackson Park, the site of the fair grounds. See COLUMBUS, CHRISTOPHER.

The word is also applied to a small fishing vessel of ten or fifteen tons used in Spain, Portugal, and the Azores, and to a large Turkish warship.

CARAWAY, a plant belonging to the parsley family, the seeds of which have a spicy fragrance and a warm, biting taste. They are a popular flavoring for cakes, candies, cookies, breads, and some varieties of cheese. Oil expressed from the seeds finds use in the manufacture of soaps and perfumes, and both seeds and oil are used to disguise the taste of disagreeable medicines. Baked apple flavored with caraway seed is an old-time English dish. The plant grows wild in Europe and Asia. It is a biennial (see BIENNIALS). B.M.D.

Scientific Name. Caraway belongs to the family Umbelliferae. Its botanical name is *Carum carui*

CARBICE, *kahrb' ise*, OR **DRY ICE**, trade names for a refrigerant made by freezing liquid carbon dioxide, or carbonic-acid gas (which see). This odorless, colorless gas, which gives "pop" and other charged drinks their pleasing effervescent quality, is heavier than air. When frozen, it gives off a gas, also heavier than air, which pushes the warm air away, thus providing an insulating effect; for, being heavier than air, this slowly escaping gas throws a protecting insulating blanket around material with which it is packed. On the contrary, when an ordinary cake of ice melts, its mass diminishes, and warm air presses in.

Carbice is so enduring a refrigerant that it can be packed around ice cream destined to be shipped from any Atlantic port to Cuba; there is no necessity for repacking, because the carbice will not thaw *en route*. The solid gas being absolutely dry, it can be used for parcel-post shipments of perishable materials which otherwise would not be admitted to the mails. Carloads of frozen fish packed in this substance can be sent on a five-day journey without thawing. It can be made at a cost which competes with that of ordinary ice, but which is really less when relative efficiency is the basis of comparison.

Carbice is now manufactured by two American companies, who have protected their processes by patents. While the methods of manufacture cannot be outlined in full, it may be explained that the liquid carbon dioxide is led through a coil around a large expansion chamber, which cools the liquid. It is then sent through spray nozzles into the chamber, and at once a snowstorm of solid carbon dioxide begins to fall.

When there is enough snow in the chamber to form a block, a plunger is operated, which automatically reverses when a fixed size of cake has been compressed. The cake, of about twenty pounds, is then removed, and meanwhile the snow has been falling in the chamber to form the next cake. These cakes have a Fahrenheit temperature of 110° to 114° below zero. See illustration, page 1191.

CARBIDES, *kahr' bydz*, compounds formed by the union of carbon with metals. Those of most interest are the carbide of iron and the carbide of calcium. The presence of carbon in iron in varying proportions changes its properties, the differences between pig iron, wrought iron, and steel being largely due to the different proportions of carbon and carbide of iron in each. Calcium carbide is of interest as the source of acetylene gas and of calcium cyanamide. See ACETYLENE; CALCIUM CARBIDE; IRON AND STEEL. T.B.J.

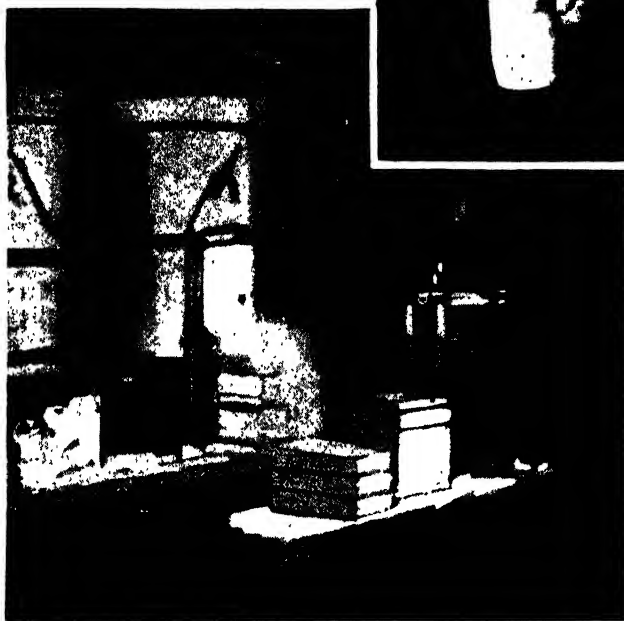
CARBOHYDRATES, *kahr bo hi' drates*. When you sit down in the morning and enjoy your breakfast of oatmeal or other cereal, relish

your piece of bread and butter, and sip your coffee, to which you have added cream and sugar, you are introducing into your body a number of substances that belong to the group known as *carbohydrates*. The carbohydrates are chemical compounds that are found in great quantities in the animal and vegetable world, and are composed of carbon, oxygen, and hydrogen. Among the carbohydrates are starch, various kinds of sugar, and cellulose. All vegetable foods are rich in carbohydrates. Starch forms a great proportion of the nourishing part of the cereals—wheat, oats, corn, rye, and rice; these contain, besides, a good proportion of *fats* and *proteins*, the other chief groups which form the nourishing part of the various articles of food. Granulated sugar is a pure carbohydrate. Molasses, honey, and fruits contain large proportions of carbohydrates in the form of special sugars. Milk also contains a carbohydrate known as *lactose*, or *sugar of milk*.

all vegetable foods are easily digested. Like the fats, they serve as fuel to keep the body warm and to provide energy for its movements.



DRY ICE USED IN TRANSPORTING
ICE CREAM



ONE METHOD OF PRODUCING THE NEW REFRIGERANT

Tanks and press in which dry ice is manufactured, with finished blocks in the foreground.

The carbohydrates are among the most necessary and most important substances in our daily food. The starches and sugars found in

Neither fats nor carbohydrates, however, can be converted into muscle, as can proteins. It is impossible to live on carbohydrates alone, or even on carbohydrates and fats together. A certain amount of protein is necessary in the diet, to provide for the growth of the body, and to repair the waste of muscular tissue which is always going on. E.V.M'C.

Related Subjects. For supplementary information, the reader is referred in these volumes to the following articles.

Biochemistry	Human Growth
Botany (Contributions)	Metabolism
Food, subhead	Nutrition

CARBOLIC, *kahr bol' ik*, **ACID**, OR **PHENOL**, *fe' nol*, or *fe'-nole*, an acid obtained from coal tar, having a peculiar and not unpleasant odor. When pure, carbolic acid is in the form of white crystals; when long exposed to the light, however, these crystals turn red.

*Carbolic acid is easily melted. It is only slightly soluble in cold water. It is a powerful disinfectant, and is employed for cleansing surgical instruments, walls, floors, and utensils used about those afflicted with contagious diseases. It was formerly in general use to protect wounds in surgery, but under modern methods, it is not commonly so employed. Taken into the stomach, except in very weak solutions, it acts as a powerful poison, and causes death if relief is not prompt (see ANTI-DOTE, for treatment). Medicinally, it is a remedy for stomach and intestinal gas, but no one should ever use it except as prescribed by a reliable physician. It is also useful as a gargle and as an external remedy for itching. In industry, carbolic acid is manufactured synthetically in enormous quantities, and finds wide application in the manufacture of bakelite (also called *condensite* and *redmanol*), a substance used in making telephone receivers, electric-lamp sockets, phonograph disks, and other articles which need to be resistant to acids, moisture, and electricity. See BAKELITE; DISINFECTANT.* T.B.J.

Chemical Formula. The formula for carbolic acid is C_6H_5OH . A molecule is made up of six atoms of carbon, five of hydrogen, and the radical *OH*; the latter is a hydroxyl group, consisting of one atom each of oxygen and hydrogen, which can remain unchanged in many chemical reactions and have the effect of a single atom.

CARBON. We all know what *coal* is, and sometimes we see *charcoal*. We are familiar with the so-called "lead" in our pencils, which is not lead at all, but *graphite*, and frequently we see a *diamond*. All of these substances are different forms of the element carbon, but the diamond is crystallized in one way, graphite in another, and charcoal is not crystallized at all; in other words, its atoms are not arranged in any definite order. Coal contains much carbon in combination with other elements. Some hard coals, or *anthracites*, contain over ninety per cent of carbon. The coke left in the retorts when coal is heated to make gas is, like wood charcoal, an impure amorphous (un-crystallized) carbon. The purest amorphous carbon is made by heating sugar in a loosely covered crucible until gas ceases to come off.

Carbon is one of the chemical elements, and it exists in the three forms mentioned. Although it makes up less than one per cent of all matter, it enters into the composition of all living things, and forms a part of all foodstuffs. Since it was once believed that organic substances could be produced only in living organisms, all of which contain carbon, the branch of chemistry that treats of carbon compounds was called *organic chemistry*. This term is still used for convenience, though it is known that many organic compounds can be made artificially.

There are more than 250,000 known compounds of carbon, and they exist in infinite variety. With oxygen, carbon forms carbon monoxide and carbonic-acid gas. Plants absorb the latter, using the carbon to manufacture plant food. With hydrogen, carbon forms an extensive class of compounds known as *hydrocarbons*, which form the chief ingredients of petroleum, natural gas, gasoline, turpentine, certain coal-tar products, and many other substances of paramount importance in industry. The dyestuff industry of the world has been developed by practical application of the chemistry of carbon and its many chemical combinations with nitrogen, oxygen, hydrogen, and other elements. The carbide industry is one of enormous commercial interest which is dependent on a knowledge of the peculiar activity of the element carbon. The chemical symbol of carbon (see CHEMISTRY) is C. T.B.J.

Related Subjects. A broader view of this topic may be secured by reading the following articles in these volumes.

Boneblack	Coal
Carbides	Coke
Carbonates	Diamond
Carbonic-Acid Gas	Gas
Carbon Monoxide	Graphite
Charcoal	Hydrocarbons

CARBONADO, *kahr' bona' doh*. See DIAMOND.

CARBONARI, *kahr' bo na' rie*. See MAZZINI, GIUSEPPE.

CARBONATE OF LEAD. See LEAD.

CARBONATES, *kahr' bon ates*, salts of carbonic acid, such as sodium carbonate and calcium carbonate. Calcium carbonate, or carbonate of lime, is the most abundant of the natural carbonates. It exists as calcite, limestone and marble, chalk and marl, and is the chief constituent of egg shells, oyster shells, pearls, and coral, and an important constituent of bones. Whiting is fine calcium carbonate, and putty is the same material mixed with linseed oil. The common carbonate of soda, or sal soda, is a well-known washing powder, and bicarbonate of soda is used in cooking and for numerous other purposes. Carbonate of copper, known to the mineralogist as *cerussite*, is a valuable ore from which copper is obtained. and one of the iron ores, *siderite*, is a carbonate of iron. Some carbonates are used in dyeing, and others in medicine. When a carbonate is treated with an acid, carbonic-acid gas (which see) is set free. T.B.J.

CARBONDALE, PA. See PENNSYLVANIA (back of map).

CARBON DIOXIDE, *di ok' side*, or *di ok' sid*. See CHEMISTRY (Contributions of Chemistry to Human Welfare); OXYGEN; CARBONIC-ACID GAS.

CARBON DISULPHIDE, *di sul' fide*, OR **CARBON BISULPHIDE**, a compound of carbon and sulphur, which is known as a heavy, colorless liquid. When pure, it has rather a pleasant odor, but ordinarily, owing to the

presence of impurities, it has a very unpleasant smell. It readily dissolves india rubber, gutta-percha, sulphur, phosphorus, and resins. Carbon disulphide is sometimes used to kill moths and other insects, as well as burrowing animals, such as moles and woodchucks, and small animals in buildings, as rats and mice in mills. Another important use is in the manufacture of artificial silk from wood pulp. Carbon disulphide is manufactured by heating its elements, carbon and sulphur, together. The form of carbon commonly used is coke, and the temperature required is a bright-red heat. Electric furnaces are now used almost exclusively for the purpose. See RAYON. T.B.J.

Chemical Formula. The formula for carbon disulphide is CS_2 , that is, a molecule consists of one atom of carbon and two atoms of sulphur.

CARBONIC-ACID GAS, OR CARBON DIOXIDE, names of a gas which is formed when charcoal, wood, coal, oil, or almost any material containing the element *carbon* burns in a free supply of air. The name *carbon dioxide* signifies that the molecules of the gas consist of one atom of carbon combined with two atoms of oxygen. The name *carbonic-acid gas* has reference to the faintly acid character of the liquid obtained by dissolving the gas in water. Under the misleading name of *soda water*, this solution is familiar as an effervescent drink. Carbonic-acid gas is colorless and has only a very faint odor. It is about one and a half times as heavy as air, and a common lecture experiment is to pour it from vessel to vessel like water. When so poured upon a lighted candle, it extinguishes the flame, for carbon dioxide does not support combustion. Indeed, the gas is often used to extinguish fires (see subhead under FIRE DEPARTMENT).

Carbon dioxide exists in the atmosphere in the small proportion of three parts in 10,000. Air containing ten times this proportion of carbon dioxide can be breathed without danger, but in pure carbon dioxide or in air containing a large proportion of it, men and animals are quickly suffocated. Since they suffer much the same as in drowning, it is thought that the gas is not an active poison and that the injurious effects are really due to lack of free oxygen, for animals cannot separate the oxygen of the compound from the carbon.

Interchange Between Plants and Animals. All animals, including man, give off carbonic-acid gas in breathing; it is also produced by fires, and from these sources it is constantly poured into the atmosphere. But what the animals give off the plants absorb, for to them it is a life-sustaining element, as is oxygen to animals. Under the action of sunlight, the leaves of plants absorb carbonic-acid gas through their pores and liberate part of the oxygen, returning it to the air. Thus plants

and animals supply the atmosphere in a measure with what each group needs to enable it to live and grow, and their interchange of gases helps to maintain the relative proportion of oxygen in the air.

Choke Damp. Carbonic-acid gas is produced in fermentation and decay. Being heavier than the air, it is apt to remain for a long time in wells and silos, as well as in caves and mines, in sufficient quantities to suffocate one entering these places. A lighted lantern lowered into the suspected place shows at once whether or not the gas is present. If the light is extinguished, the place is unsafe. This gas is formed in mine explosions and often accumulates in poorly ventilated chambers, where many miners lose their lives by suffocation. See MINING.

Liquid Carbon Dioxide. Carbon dioxide, when subjected to heavy pressure and a temperature of 5° F. below zero, is easily changed to liquid. This acid is manufactured on a large scale by forcing the gas into steel cylinders by means of a powerful pump, until the pressure becomes sufficient to change the gas into liquid. The large quantities of carbon dioxide produced in the process of brewing are now saved and used in this way. Liquid carbon dioxide is also made directly in factories established for the purpose. It is used in the making of soda water, beer, champagne, mineral waters, and other effervescent drinks, to which it imparts a sparkling appearance and biting taste. An efficient refrigerant made by freezing liquid carbon dioxide is described under the title CARBICE. T.B.J.

Chemical Formula. The formula for carbonic-acid gas is CO_2 , each molecule containing one atom of carbon and two atoms of oxygen.

CARBONIFEROUS, *kahr bon if' ur us*, **PERIOD**, the closing period of the Paleozoic Era, according to the usage adopted by the United States Geological Survey and followed in most standard classifications. The name was given because the most striking characteristic of the system of strata deposited at that time is the great beds of coal found in it in many parts of the world. The period is subdivided into the Mississippian, Pennsylvanian, and Permian epochs, which are ranked as periods by many American geologists. In most other countries the Permian is regarded as a separate period, and the Carboniferous is divided into the Lower and Upper Carboniferous epochs, equivalent respectively to the Mississippian and Pennsylvanian.

The Mississippian, or Lower Carboniferous, series is found in the Appalachian region, the North-Central states, parts of the Western states, Alaska, and elsewhere. It is named because of its great development in states near the Mississippi River. The dominant rocks are limestones, shales, and sandstones, and they

are the source of such valuable products as oil, gas, building stone, gypsum, salt, and zinc ore. Strata of Lower Carboniferous age are extensively developed in other continents. In Western Europe limestone is the dominant rock, but in Central Europe there are great formations of shale and sandstone.

The strata of the Pennsylvanian, or Upper Carboniferous, series contain the world's greatest supply of workable coal. In North America the coal-bearing rocks are found chiefly in the Maritime provinces of Canada, the anthracite field of Eastern Pennsylvania, the great Appalachian field that extends from Western Pennsylvania to Alabama, the southern peninsula of Michigan, and in the Central states from Indiana and Western Kentucky to Eastern Kansas and North-Central Texas. West of the Great Plains the series is widely extended, but contains coal in only a few districts. In Europe coal-bearing strata of Upper Carboniferous age are found in the British Isles, France, Belgium, Germany, Spain, Russia, Austria, Czechoslovakia, and Yugoslavia. China has some of the richest coal fields in the world.

The plant life of the period is of great scientific interest, because the coal was formed mostly from these plants. Fossils in the coal beds show that the plants were similar to our ferns, horsetails, and club mosses, but that they were much larger than any such plants now existing, even in tropical regions. Ferns and horsetails grew to the size of trees, and club mosses were of gigantic proportions. Not only were the plants of unusual size, but vegetation was more luxuriant, and growth must have been more rapid than in the most thriving tropical regions of the present time. There were animals that resembled salamanders, frogs, and other forms of batrachians; insects were numerous, including huge cockroaches and dragon flies, and there were numerous kinds of fish, mollusks, and crustaceans. No remains of large animals have been found. L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles

Coal	Fossil	Paleozoic Era
Devonian Period	Geology	Permian Epoch

CARBON LAMP. See ELECTRIC LIGHT.

CARBON MONOXIDE, *mon ok' side*, a colorless, odorless gas, formed when carbon dioxide is passed through heated carbon. In it the carbon is combined with only half as much oxygen as in carbon dioxide. Its molecule consists of one atom of each element, whence the prefix *mon*, meaning *one*. Carbon monoxide is used as a fuel and as a reducing agent in the extraction of metals from their ores. The gas is extremely poisonous, and burns with a blue flame which is seen in anthracite or charcoal fires. It is found in ordi-

nary illuminating gas, especially in "water gas" (see GAS), which, because of it, is dangerous to inhale in even the minutest quantities. Carbon monoxide sometimes escapes from coal stoves and furnaces and causes stupefaction and death to whole families. One volume of it in 100,000 volumes of air produces symptoms of poisoning, and one volume in 750 of air causes death in half an hour. The exhaust fumes from automobiles contain deadly quantities of carbon monoxide. A man who shuts himself in his garage and leaves his motor running is taking a serious risk. See ASPHYXIATION. T.B.J.

Chemical Formula. The formula for carbon monoxide is CO, indicating that a molecule contains one atom of carbon and one of oxygen.

CARBORUNDUM, *kahr bo run' dum*, a very hard substance used in place of emery and sandpaper as an abrasive (for polishing). Carborundum is made by mixing in proper proportions coke, sand, sawdust, and a small quantity of salt, and subjecting the mixture to intense heat in an electric furnace constructed especially for the purpose. It requires about thirty-six hours to complete the process. When it comes from the furnace, carborundum is a mass of coarse crystals that reflect nearly all the colors of the rainbow, but when ground to powder it is gray. The finest powder is used for polishing; coarser grades are used in place of emery. Hones of various degrees of fineness are made from it, the finest being used for sharpening razors and surgical instruments. Carborundum is a chemical compound of carbon and silicon. It is manufactured in large quantities at Niagara, N. Y. See, also, CORUNDUM; EMERY. T.B.J.

Chemical Formula. The formula for carborundum is CSi; that is, a molecule contains one atom each of carbon and silicon.

CARBUNCLE, the name now applied to the crimson and scarlet varieties of garnet when cut with a smooth, rounded surface curving outwards. The term comes from a Latin word meaning *little coal*; the ancients gave the name to any red, fiery stone that glowed in the darkness like a burning coal. Certain ancient Jewish writers held that the ark of Noah received its light from carbuncles and other precious gems. The carbuncle is named in *Exodus xxviii* as one of the gems in the breastplate of Aaron, the high priest of the Children of Israel. See GARNET; GEMS; HIGH PRIEST. T.B.J.

CARBUNCLE. See ABSCESS; BOIL.

CARBURETOR, *kahr' bu ret ur*. In an internal-combustion engine using a liquid fuel, a carburetor is a device for converting the liquid into a mist or vapor and for mixing the vapor with air in such proportions that the mixture

will burn instantly and without smoke. The function of the carburetor, in other words, is to insure perfect combustion. It must mix the fuel with air under wide variations of engine speed and power, must vaporize the mixture under variations of temperature, must respond at once to a demand for greater or less speed, and must do all these things in spite of variations in the quality of the gasoline or other fuel used. The carburetor is, therefore, a very delicate instrument, but at the same time its method of operation is easily understood.

The process may be more quickly understood if the meaning of the word carburetor is known. To *carburete* means to saturate or combine chemically with carbon; that is, the carburetor combines air with carbon, which is not pure, but may be in the form of gasoline, kerosene, or other liquid. The process of mixing the air and carbon is called *carburation*. The modern carburetor usually has three inlets and one outlet. One of the inlets is for the fuel, another is for air, and there is usually an additional inlet, called the auxiliary, or secondary, inlet, also for air. The only outlet is to the engine, and it usually has the throttle valve attached to it.

The Process of Carburation. The fuel enters the carburetor sometimes by gravity from a tank situated at a higher level; but usually it is forced into the carburetor by air pressure or automatically by combustion, which creates a pressure greater than the pressure of air in the storage tank. An excessive flow of gasoline into the carburetor is prevented by a float in a chamber through which the gasoline flows. As the level of gasoline in the carburetor reaches the desired point, the float rises and finally closes a valve in the supply pipe.

From the float chamber, a passage leads to a jet nozzle, through which the gasoline is sprayed into the mixing chamber. The nozzle is about one-sixteenth of an inch above the level of the liquid in the float chamber when the air pressure at the jet and in the float chamber are the same. Under these conditions, there is no flow of liquid. However, when the piston of the engine is drawn back, the air pressure at the nozzle and in the air pipe is reduced. As the pressure at the nozzle is then less than the pressure in the float chamber, the liquid is at once forced through the nozzle into the mixing chamber. When the engine has been at rest, it is necessary to make this initial suction at the nozzle by "turning the engine over," or "cranking" it, which may be done by hand or by a mechanical appliance called a "starter."

The air inlet, which is usually protected with a fine screen to keep out dirt, also opens into the mixing chamber. Under normal conditions, the air inlet is adjusted so that a sufficient supply of air enters to secure perfect combustion.

However, if the engine is going at high speed, the liquid, being heavier, tends to flow into the mixing chamber more rapidly than needed. To offset this increase, most carburetors are provided with an auxiliary air inlet. The valve on this inlet is held closed by a spring until the pressure inside the mixing chamber is dangerously low, when the valve opens in response to the pressure of air from the outside.

The only outlet from the carburetor leads to the cylinder of the engine. The gas, mixed with air, enters the cylinder, and is there exploded by an electric spark. [An illustration of the carburetor will be found in the article **AUTOMOBILE**. See, also, **GAS ENGINE**.]

CARCINOMA, *kahr si no' mah*. See **CANCER**.

CARDAMOM, *kahr' da mum*, the fruit and enclosed seeds of different species of plants belonging to the ginger family. Because of their pungent, spicy flavor, cardamoms are widely used in some countries as seasoning in sauces, curries, and cordials, while an essential oil, expressed from the seeds, is valued as an ingredient of medicines because of its stimulating properties. In Northern Germany, pastry flavored with cardamom is a universal favorite. The fruits of different cardamoms vary in kind and strength of flavor. The true, or official, cardamom recognized in America and British pharmacopoeias is native to India. Its oil, which has stimulating properties, is expressed from the seeds by distillation with water.

B.M.D.

Scientific Names. Cardamoms belong to the family *Zingiberaceae*. Official cardamom is *Elettaria cardamomum*. A species native to the East Indies, which is used widely as a condiment, is *Amomum cardamomum*.

CARDAN, JEROME, pioneer in education of the deaf and dumb. See **DEAF AND DUMB** (The Education of Deaf-Mutes).

CARDANO, *kahr da' no*. See **ALGEBRA**.

CARDAN'S RULE. See **ALGEBRA**.

CARDENAS, *kahr' da nahs*, a Spanish explorer. See **UTAH** (History).

CARDIAC ORIFICE. See **STOMACH**.

CARDIFF. See **WALES** (The Cities).

CARDIGAN, LORD. See **CHARGE OF THE LIGHT BRIGADE; CRIMEA** (War).

CARDINAL, in the Roman Catholic Church, a counselor of the Pope and a dignitary next in rank to him. The name, which comes from the Latin word for *hinge* and consequently denotes something of great importance, was first given to priests who were permanently attached to a church. Later, its use was restricted to those priests who held prominent positions. Then, as the new administration of the affairs of the Church became more burdensome, the Pope called upon bishops to assist him, and these were designated as cardinal-bishops. Finally, the cardinal became a coun-

selor of the Pope and gave his entire time to his office. Under the direction of the Pope, the cardinals conduct the administration of the Church.

Cardinals are appointed by the Pope, and while it is intended to have a representative of each prominent nation in the College of Cardinals, by far the greater number of them have always been Italians. The first American cardinal, McCloskey, was appointed in 1875. There are now four American cardinals, Wil-



Photo: Visual Education Service

CARDINAL BIRDS

liam H. O'Connell of Boston, Dennis J. Dougherty of Philadelphia, Patrick J. Hayes of New York, and George W. Mundelein of Chicago.

Taken together, the cardinals form the *Sacred College*, or College of Cardinals, which is an incorporated body with an income of its own. The number of cardinals may vary, but was fixed at seventy by Sixtus V in 1586. On the death of the Pope, the Sacred College elects his successor, from its own membership (see SACRED COLLEGE). The official symbols of a cardinal are the *biretta*, or red cap; the sapphire ring; the red cassock; the miter of white silk; and the red hat. This last is placed on the head of the newly made cardinal at the time of his appointment, by the Pope himself, but is then laid away and never worn again. At the cardinal's funeral it is placed on his casket.

Related Subjects. The reader is referred in these volumes to articles relating to the American cardinals, under their names in alphabetical order, and to the article POPE, where will be found an account of the manner of election of the Pope.

CARDINAL BIRD, OR REDBIRD, one of the most beautiful wild birds of North America, so named from the rosy-red plumage of the male bird. The cardinal belongs to the finch family, and is also known as the *crested redbird*, the *cardinal grosbeak*, and the *Virginia nightingale*. James Lane Allen has given the bird another name in his sympathetic and tender book, *The Kentucky Cardinal*, in which he pleads for its protection from the sportsman's gun. The cardinal bird is about eight inches in length, and bears on the head a conspicuous crest that gives it a rather distinguished appearance. The males are bright vermilion above, paler beneath, with tints of gray on the back, and black forehead and throat. The females wear olive-gray and buff.



THE CARDINAL'S
BILL OF FARE

The cardinals are resident in Eastern United States between the Gulf of Mexico and the vicinity of New York, but occasional specimens are seen as far north as Southern Canada, and westward. The cardinals are spreading northward, and are now permanent residents in the Mississippi Valley as far north as Saint Paul. In severe winter weather, they come to barnyards and corn cribs of farmers and feed on corn. They usually nest in a thicket of brambles or in a low tree, their little home being loosely made of twigs, grass, weed stems, etc., and lined with grass or roots. There are three to five dull-white or bluish eggs, with spots of reddish-brown and lilac, and two broods are usually raised each season. The birds feed on insects, worms, waste grain, and the seeds of weeds and wild fruits. The insect pests devoured include three of the enemies of cotton. The male bird never neglects his mate during the breeding season, but keeps her and the young well supplied with food.

The cardinal is one of the sweetest songsters of America, its songs reminding one of the nightingale's music, though lacking the haunting melancholy of the latter's notes. Until the practice was prohibited by law, large numbers were shipped to Europe under the name of *Virginia nightingale*. D.L.

Scientific Name. The cardinal bird belongs to the family *Fringillidae*. Its scientific name is *Cardinalis cardinalis*.

CARDINAL FLOWER, OR INDIAN PINK, a showy native wild flower belonging to the lobelia family. At one time its gorgeous red blossoms spread a gay carpet over the borders of marshes and river banks throughout the

eastern part of Canada and the United States, but the plant has become one of our rarer wild flowers through ruthless picking. The blossoms are borne on an erect stem from two to four feet high, and have the tube shape and cleft lips characteristic of the lobelias. Though found in damp places in nature, the cardinal flower readily adapts itself to drier situations, and well repays attempts to cultivate it in the home garden. See LOBELIA. B.M.D.



Scientific Name.
The cardinal flower belongs to the family *Lobeliaceae*. Its botanical name is *Lobelia cardinalis*.

CARDINAL FLOWER

CARDS, PLAYING, oblong pieces of cardboard bearing certain spots and figures, which are used in playing games of chance or skill. They are considered by some to be an innocent recreation of the fireside and by others the most widespread gambling device the world has ever seen. Playing cards are of ancient origin. The course that card-playing took in its European diffusion shows that it probably came from the Orient, for it was first found in the Eastern and Southern countries. Historical trace of cards was found earliest in Italy, then in Germany, France, and Spain, in the order named.

The set of cards commonly used in Europe and America is known as a *deck*, or *pack*, and consists of fifty-two cards containing four suits—spades and clubs, which are printed in black, and diamonds and hearts, printed in red. A suit is composed of thirteen cards consisting of king, queen, knave (or jack), known as face cards, and ten spot-cards, sometimes called pip-cards, ranging in number of spots from one, or the ace, to ten. The natural rank in the suit sometimes places the king highest, and so on down, the ace being the lowest; but in most games this rank is changed, the ace being the highest, the king second, etc. A great variety of games may be played with cards. There are round games, as in hearts or poker, in which any number of persons may join; four persons may play euchre, whist, bridge, etc.; two may play pinochle, cribbage, or bezique; and one person may find

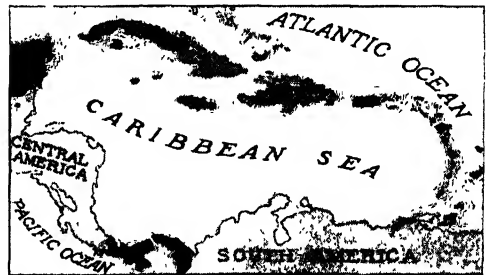
diversion in the game of solitaire. Rules for many games appear in these volumes.

CAREW, JAMES. See TERRY, ELLEN.

CAREY, HENRY, reputed author of the melody *God Save the King*. See article on that hymn, in these volumes.

CARGO MONEY. See MONEY.

CARIBBEAN, *kair i be' an*, SEA, a body of water which might be called a mammoth lagoon. It begins at the north coasts of South America and Panama and the eastern shores of Central America and Yucatan, and is almost enclosed by the West Indies. With the opening of the Panama Canal, a new prominence came to the Caribbean Sea; through it all ships must pass proceeding to or from the Atlantic end of the Panama Canal. From Trinidad on the east to Yucatan on the west, it is over 1,700



LOCATION MAP

miles long; its greatest width is from Haiti and Jamaica to Panama, about 700 miles. In parts, the sea is of great depth, soundings of 16,000 feet (nearly three miles) having been found off the coast of Cuba and near the coast of Venezuela. Its broadest entrance is the Yucatan Channel, 120 miles wide. In days of adventure, this sea was the "Spanish main."

CARIBOU, *kair' a boo*, or *kair a boo'*, the French-Canadian name for the wild reindeer of North America. Caribou have bulkier bodies than true deer, broad, deeply cleft hoofs, and large, irregular antlers. The female caribou is the only American female deer with antlers. Various classifications of these animals have been made, but two main types are everywhere recognized, the *woodland* and the *barren-ground caribou*. The former are found in the forested regions of Canada, especially in Labrador, Newfoundland, and British Columbia. They were once numerous in Northern United States, but are not seen now outside of Michigan and Maine, where they are protected by law. These caribou roam about in the summer, constantly changing their ground to escape the flies and insects that become a terrible pest, but in winter they gather together in herds, feeding on winter berries and the leaves of shrubs. Their large, hairy, cleft hoofs enable them to travel easily in the

snow, and prevent their sinking in the mire of swamps.

The barren-ground caribou is a smaller, lighter-colored animal, with immense antlers. Great herds of these caribou roam the barren, open plains of North America in regular migrations, moving northward far beyond the timber line and southward to the beginning of the forest growth. To the Indian and Eskimo inhabitants of the desolate north country, the caribou is a mainstay, for it gives its flesh for food, its marrow for soup, its hide for clothing and tents, its bones for needles and knives, its horns for fishhooks and spears, its muscle tendons for thread. Though still found in amazing numbers, these caribou are being gradually reduced everywhere by relentless slaughter.

Because caribou cannot be domesticated, the United States government has introduced the Lapp reindeer among the people of Alaska, with great success. But the experiment has been endangered by the tendency of domesticated reindeer to join the migrating wild herds. When the two interbreed, the offspring is essentially wild caribou. To save one of the finest reindeer herds in Alaska, the government had the 1,500 animals driven 1,100 miles, beyond Mount McKinley Park, to get them out of the track of the migrating caribou.

Scientific Names. Caribou belong to the family *Cervidae*. The woodland species is *Rangifer caribou*; the barren ground, *R. arcticus*.

Related Subjects. The reader is referred in these volumes to the following articles, and to other Related Subjects there listed

Alaska (Animal and Plant Life)
Animal (Migration)

Deer
Reindeer

CARICATURE, *kair' i ka ture*, comes from an old Italian word meaning to *overload* or *exaggerate*. It thus relates to any representation, whether written or in picture form, in which the peculiarities of a person or object are so exaggerated as to appear ridiculous. Written caricatures include such satires as *Don Quixote*, which laughed out of existence the absurd romances of chivalry, or as Swift's *Gulliver's Travels*, which represented the politicians of England as giants or as pygmies. But far more commonly, the word is used to mean grotesque pictures, such as those with which

modern newspapers and periodicals have made everyone familiar.

Its Necessary Elements. A successful caricature must have in it more than a suggestion of fact. To represent a strenuous man of action in the garb and the hesitating state of mind of Hamlet, or a notably grave and thoughtful man as a clown, is wide of the mark. A keen sense of perception and true humor are as much a part of the caricaturist's equipment as the ability to draw; if he possesses all these, he may be a mold of public opinion as truly as is an editor. The downfall of the "Tammany tiger" (see TAMMANY) was brought about once through Thomas Nast's clever series of caricatures, and many a politician has been made in pictures to appear so ridiculous as to be



THE CARIBOU

obliged to give up all claims to office. In a sense, the public man is unfortunate who possesses certain strong facial characteristics, for these the artist is certain to magnify. Simply two rows of shining teeth in a drawing were sufficient to suggest Theodore Roosevelt; the bald head and strong mouth of William J. Bryan served the cartoonist well. Not all cartoons are caricatures, but most of the former which have the element of humor rely largely upon the use of caricature.

Although it has taken on new importance in recent years, the art of caricaturing is by no means new. The Assyrians and Egyptians made use of it, as did the Greeks and Romans and the great painters of the Renaissance. Especially famous are the caricatures drawn by Leonardo da Vinci. In England the art really began with Hogarth, one of the greatest caricaturists the world has ever seen, and was continued by Rawlinson, Cruikshank, Leech, Tenniel, Du Maurier, and others. A list of widely known modern caricaturists who are treated in these volumes is given with the article CARTOON. See caricature illustrations, page 1199.

CARINTHIA, *ka rin' thi ah*, a province of the Austro-Hungarian Monarchy before 1918, and of the present Austria. See AUSTRIA.

CARLETON, SIR GUY (1724-1808), a British soldier and colonial governor who rendered good service to England in America in the French and Indian and the Revolutionary wars. Appointed governor of Quebec in 1775,



THE ART OF CARICATURE

If the reader will turn in these volumes to the biography of Raymond Poincaré, he will note that in the few lines of the above caricature (at the left) there is a strong facial resemblance to the portrait study. At the right, above, are a few apparently hasty strokes of the pen which depict the striking facial characteristics of Charles Dana Gibson. An essential quality of a good caricature is economy of lines in the drawing.

he later took supreme command of the British forces in Canada, successfully repelled the American attacks in the early years of the Revolution, led in the capture of Crown Point, and was raised to the rank of lieutenant general. In 1777 he was superseded by Burgoyne, but at the close of the war succeeded Sir Henry Clinton as commander in chief. For his services he was created Baron Dorchester by the king and was granted a pension of £1,000 a year. From 1786 to 1796 he was again governor of Quebec.

CARLETON, MOUNT, the highest point in New Brunswick (which see).

CARLETON, WILL (1845-1912), an American poet, known for his natural treatment of home life and the joys and sorrows common to humanity. He was born near Hudson, Mich., educated at Hillsdale College, in his native state, and soon after his graduation, in 1860, began to write. He first won public approval with *Over the Hills to the Poorhouse*, immortalizing the mother who toils for an ungrateful brood of children, only to end her days as a pauper. For many years he graced the lecture platform, and in his lectures he recited many of his poems. During the last five years of his life, he edited the literary magazine *Everywhere*. In 1923 his native state set aside his birth date, October 21, as a special day for the commemoration of literature in its public schools.

Carleton's ballads are simply written, enlivened by humor and bits of homely philosophy, and graced by touches of pathos. The following lines, from *The First Settler's Story*, are typical:

Boys flying kites haul in their white-winged birds;
You can't do that way when you're flying words;
"Careful with fire," is good advice, we know;
"Careful with words," is ten times doubly so.
Thoughts unexpressed may sometimes fall back dead;
But God Himself can't kill them when they're said.

Collections of Poems. Among his volumes are *Farm Ballads*, *Farm Legends*, *Farm Festivals*, *City Festivals*, and *Poems for Young Americans*.

Related Material. For one of the choicest quotations from the pen of this poet, see **PAYNE, JOHN HOWARD**.

CARLETON COLLEGE. See **MINNESOTA** (Education).

CARLISLE, PA. See **PENNSYLVANIA** (back of map).

CARLOMAN. See **CHARLEMAGNE**.

CARLOTTA, *kahr lot' ah*, **EMPRESS.** See **MEXICO** (Freedom).

CARLSBAD, *karls' bad*, officially now **KARLOVY VARY**, is a city of Czechoslovakia, in Bohemia, seventy miles northwest of Prague, and one of the most celebrated of European watering places. Tens of thousands of visitors in normal times are annually attracted to its hot mineral springs. The chief ingredients of the water are carbonate of soda, sulphate of soda, and common salt. The Sprudel, the most

famous of the nineteen springs, has a temperature of 165°, and discharges about 2,000 quarts of water a minute.

CARLSBAD, kahriz' bad, CAVERN. This subterranean wonder of marvelous beauty and size, in Eddy County, N. M., was brought to the attention of the government by a member of the United States Geological Survey in 1922, and was made a national monument in 1923.

This wonderland has been cut out of solid limestone by the action of water charged with carbon dioxide, and runs under the Guadalupe Mountains, near the town of Carlsbad. The extent of the cavern is still unknown; it is estimated to be the largest cave in the world, and a part of a great cave system of the region. Most of its rooms are several hundred feet below the surface of the earth; the "Big Room" is half a mile long and several hundred feet wide, with a ceiling so high that lights penetrating 350 feet upward have failed to disclose the height or magnificence of its roof.

It is not the size of the cave alone which makes it remarkable, but its lavish decoration. Rooms and passageways are ornamented with glistening curtains of crystal and marble drapery, fluted and carved walls, and with magnificent stalagmite and stalactite formations, some so delicate that a touch will crush them, others apparently strong enough to support the mountains above.

The cave had long been known as a roosting place for thousands of bats and as a valuable source of supply for guano miners, and the main portion, which visitors now come to see, was only discovered in a vain search for more guano deposits. It was a shelter for a number of small animals, such as mice, water rats, and skunks, and for an occasional mountain lion

or sheep. It is now open to visitors and further portions are being explored for new wonders.

Related Subjects. The reader is referred in these volumes to the following articles:

Cave	Pecos River
Monuments, National	Stalactites and Stalagmites

CARLUDOVIC

CA, kahr lu doh vi'-kah, the tree which supplies the fiber for Panama hats. See **ECUADOR** (Physical Features and Climate).

CARLYLE, kahr lile', THOMAS (1795-1881). The work of this original Scottish writer is permeated by an intense hatred of shams and a belief that work and duty, not happiness, should be the aim of life. His own life was a true expression of his creed. Always he chose laborious effort instead of ease; and the consciousness of having done his best meant more to him than cheap popularity. Carlyle was the eldest of nine children. His father, a frugal stone-mason of Ecclesfechan, in Dumfriesshire, appreciated the unusual ability of his



Photo Wide World

IN ONE OF THE CAVERNS

A stalagmite of somber hue is surrounded by pendants of sparkling white.

son, and gave him a good education. When the boy was fourteen he walked ninety miles to Edinburgh, to enter the university. He had planned to study for the ministry, but, during his years at the university, he found that general reading was far more to his taste than theological studies.

Accordingly, young Carlyle gave up the idea of becoming a minister, and for a time was a teacher. This troubled his independent spirit, however, and in 1818 he removed to Edinburgh and began to support himself by writing for magazines. By 1825, when his *Life of Schiller* was published in book form, Carlyle had won recognition as a translator and talented writer of critical and biographical essays, but his true genius was not yet appreciated.

In 1826 he married Jane Baille Welsh, a descendant of John Knox, and two years later the couple removed to the "loneliest nook in Britain," a small estate in Dumfriesshire, called Craigenputtock. Some of Carlyle's finest work was done in the secluded house on the moors, where Mrs. Carlyle, reduced to a household drudge, struggled to give her husband the quietude and comfort he needed. Here, too, he made a valiant fight to preserve his independence, oppressed by money troubles and tormented by a dyspepsia that "gnawed like a rat at his stomach."

Realizing, finally, that their affairs were at a crisis, the Carlyles removed to London in 1834, and established themselves in what was to be their permanent home. (The house, Number 24 Cheyne Row, Chelsea, is to-day cherished as a public memorial of the famous writer.) Carlyle, meanwhile, had become interested in the French Revolution, and, encouraged by the enthusiasm of his good friend John Stuart Mill, who loaned him a fine collection of historical books, he began a history of the period, completing the first volume in March, 1835. Mill was anxious to read the manuscript, and the author consented to his taking it home. One evening Mill visited his friend with a countenance so ghastly that Carlyle was prepared for the disclosure of a major disaster. It was indeed a tragic tale he heard, but one affecting himself. Mill's housemaid had used the precious manuscript to kindle a fire, and the laborious work of five months was utterly undone. "One can forgive volumes of recorded crabbedness," says a sympathetic biographer, "when Carlyle's attitude toward Mill is learned. Mrs. Carlyle reported that her husband said to her: 'Mill, poor fellow, is terribly cut up. We must endeavor to hide from him how very serious this business is for us.'"

In order to make it easier for Mill, Carlyle accepted from him a sum amounting to about \$500, and after a few weeks of rest, during which he eased the strain by reading Captain Marryat's sea novels, he rewrote the volume, though all the notes had been destroyed. Thereafter Carlyle's hard times were over, for the book when published was an assured success, and his subsequent writings, some of which were delivered originally as lectures,

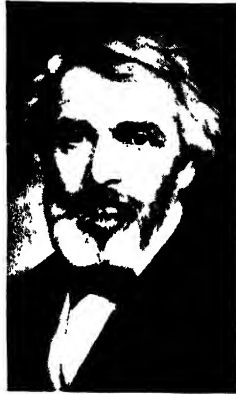


Photo Brown Bros.
THOMAS CARLYLE

found an appreciative public. In 1866, having been elected lord rector of Edinburgh University, he delivered an installation address to the students on *The Choice of Books*. While he was still in Scotland, the news reached him that his wife had died suddenly in London, and from his grief he never recovered. He died at Chelsea in 1881, and in the years immediately following, his *Reminiscences* and *Life*, as well as the *Letters of Jane Welsh Carlyle*, were published by James Anthony Froude. Some of the revelations contained in these works greatly injured Carlyle's reputation for a time, but gradually the bitterness was forgotten, while the sincerity and true greatness of the man came once more to the fore.

Of no author is it more true that "the style is the man" than of Carlyle, for his disjointed, rugged sentences and his fiery appeals give a very true picture of him. The following quotations give some of the notes of his philosophy:

Clever men are good, but they are not the best.

There is no life of a man, faithfully recorded, but is a heroic poem of its sort, rhymed or unrhymed.

Happy are the people whose annals are blank in history books.

The true university of these days is a collection of books.

Carlyle's Writings. The *Life of Schiller*, Carlyle's first important work, appeared originally in the *London Magazine*. It was enlarged and printed in book form in 1825. Another important early work was his translation of Goethe's *Wilhelm Meister*, published in 1824. *Sartor Resartus* ("The Tailor Re-tailored"), which was printed in *Fraser's Magazine* in 1833-1834, was severely criticized on its publication, but is now acknowledged to be the work of a great genius. This book seems to be a puzzling mixture of the ridiculous and the sublime, the pathetic and the humorous, but the heart of it is Carlyle's philosophy, expressed in language that occasionally rises to exalted heights. Both this work and his warmly admired *Essay on Burns* were written at Craigenputtock. *The French Revolution*, which had so troubled a career, is a vivid and dramatic picture of that tempestuous period. *Chartism, Past and Present*, and *Heroes and Hero-Worship* sustained the fame which the author's earlier work had gained for him, and *Oliver Cromwell's Letters and Speeches, with Elucidations and a Connecting Narrative*, roused new enthusiasm. The largest and most laborious work of his life, *Frederick the Great*, appeared between 1858 and 1865. After his wife's death, he edited her letters, but he had no energy for further creative work.

CARMAN, [WILLIAM] BLISS (1861-1929), the foremost lyric poet of Canada. He was born in Fredericton, New Brunswick, and enjoys a common ancestry with Ralph Waldo Emerson. In addition to his natural abilities and his heritage of culture, Carman had excellent educational advantages, including courses at the University of New Brunswick, Harvard, and the University of Edinburgh. In 1893, when his first volume of lyrics, *Low Tide on Grand-Pré*, appeared, he was already known as a

magazine writer and as office editor of the New York *Independent*; this work brought him to the public notice as a young poet of striking promise—a promise which his later work fulfilled.

Carman's depth and richness of imagination and his gift for expressing his emotions in beautiful and fitting language are suggested by the following lines from *At the Granite Gate*:

And the lone wood-bird—Hark!
The whippoorwill, night-long,
Threshing the summer dark
With his dim flail of song,
Shall be the lyric lift,
When all my senses creep,
To bear me through the rift
In the blue range of sleep.

What He Wrote. Among Carman's books of verse are the series of *Songs from Vagabondia* (with Richard Hovey), *Pipes of Pan*, *Ballads of Lost Haven*, and *A Winter Holiday*. His graceful prose essays include *Kinship of Nature*, *Friendship of Art*, and *The Making of Personality*. None of his later works is considered superior to his first published volume.

CARMELITES. See MENDICANT ORDERS.

CARMEN. See OPERA.

CARMINE, *kahr' min*, a beautiful red coloring matter made from the dried bodies of certain scale insects known as *cochineal*, which are native to Mexico and Central America (see COCHINEAL). In the preparation of carmine, various chemicals, including alum and hydrochloric acid, are added to a decoction of the substance, which separates out in the form of a fine red powder. Carmine was formerly much used in making artificial flowers, water colors, rouge, and red ink, in silk-dyeing and in miniature-painting, but its importance has greatly declined with the development of manufactured dyes (see DYEING AND DYESTUFFS).

A.L.F.

CARNARVON, *kahr' nahr vahn*, LORD GEORGE EDWARD. See TUTANKHAMEN; EGYPT (Modern Excavations); ARCHAEOLOGY.

CARNATION, one of the most popular of flowers. It has been cultivated from very ancient times for its clovelike fragrance and its beauty, being utilized for perfumes and for decoration. It was brought from Southern Europe long ago as a wild flower of fleshlike hue. Under cultivation, it now grows in many forms, and in tints dainty or bright, to please the taste of all. The present-day superb commercial varieties are an American product, based, however, upon a perpetual-flowering stock introduced from France about seventy-five years ago. The carnation has been called the "winter flower," since it blooms chiefly in the winter months, from October till the end of March. Carnations are usually raised from layers or cuttings. They need turfy loam mixed with a little manure and leaf mold, and some sharp sand to keep the soil loose.

This flower is subject to several diseases, the worst being stem rot and rust. The latter can be checked by spraying with a solution of sulphide of potassium. Stem rot is controlled largely by care in the selection and frequent change of soil. When large blossoms and a long stem are desired, remove all blooms, but leave the bud at the very end. B.M.D.

Classification.

Carnations belong to the pink family, *Silenaceae*, and to the genus *Dianthus*.



CARNEGIE,

kahr neg' ie, ANDREW (1835-1919). Of all the men of European birth who have

while the hollyhock, The pink, and the carnation vie With lupin and with lavender, To decorate the fading year.

—MOIR, in *The Birth of the Flowers*

won fame and fortune in America, Andrew Carnegie has probably the most remarkable life-story. With only a grammar-school education, forced to work hard from early boyhood, and to adapt himself to a new country and new surroundings, by middle age he was one of the richest men in the world. He regarded his wealth as a public trust, and after he had built up his huge fortune, he systematically gave away the larger part of it for the betterment of mankind. This great philanthropist was born in Dunfermline, Scotland, on Nov. 25, 1835. There, between the ages of eight and thirteen, he received the only regular schooling he ever had. His father was a hand weaver who lost his sole means of supporting the family through the introduction of steam machinery. With poverty staring him in the face, this thrifty, self-respecting Scotchman sold his looms and household effects, and sailed to America with his wife and two sons—Andrew, a lad of thirteen, and five-year-old Thomas.

The Carnegies settled in Allegheny City, a suburb of Pittsburgh, where relatives had already made homes for themselves, and ere

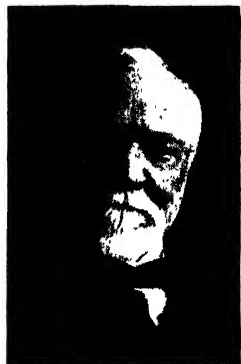


Photo: U & U

ANDREW CARNEGIE

long young Andrew was working as bobbin boy in a cotton factory, for one dollar and twenty cents a week. The father, too, was employed there, and the mother eked out the small family income by binding shoes at home, giving such time as she could spare from her housework. Always, however, she kept before her children the highest ideals of conduct, and it was natural for young Andrew to do his best in whatever work he undertook. His progress was gradual, but sure; at fifteen he became a telegraph messenger boy in Pittsburgh, and when, after a year, he was raised from eleven and a quarter to thirteen and a half dollars a month, he was the happiest boy in town. Having taught himself, in odd moments, to send and decipher telegraphic messages, he became an operator at the age of seventeen, and was drawing twenty-five dollars a month.

Carnegie advanced next to the position of railroad clerk in the office of the division superintendent of the Pennsylvania Railroad, at Pittsburgh, worked himself into the duties of train dispatcher, and when, in 1859, his chief was appointed vice-president of the company, was himself made division manager. He was then only twenty-four years old, but he had already taken on the support of his mother and brother, his father having died, and he had made some modest investments that laid the foundations of his great fortune. One of these was the purchase of stock in the Woodruff Sleeping Car Company, the successful fore-runner of the Pullman Company. By cautious investment in Pennsylvania oil lands, he increased his wealth enormously.

After the War of Secession, Carnegie entered the iron business, for his keen mind saw that steel was destined to take the place of wood in construction. In 1868 he introduced the Bessemer process into the American steel industry. The great steel works which he established at Homestead, Pa., and elsewhere, grew rapidly, and in 1899 he consolidated all his interests in the Carnegie Steel Company, one of the greatest industrial institutions of America. When, in 1901, it was merged with the United States Steel Corporation, he retired from business with a fortune estimated at half a billion dollars. Thereafter he devoted himself largely to philanthropy. It was his hope to die a poor man, but though he greatly reduced his personal fortune, he was worth over \$22,000,000 at his death.

The scope of his public benefactions has been world-wide. Besides the five institutions which receive special attention in articles following, his gifts include \$11,000,000 to the Carnegie Institute of Technology, Pittsburgh; \$10,000,000 to Scotch universities, including Saint Andrews and Aberdeen, for both of which he served as lord rector; \$5,000,000 as a benefit fund for employees of the Carnegie Steel Com-

pany; a \$2,500,000 trust for Dunfermline, his native town; \$3,750,000 to the Carnegie Church Peace Union, which aims to enlist all churches on behalf of permanent peace; \$1,750,000 for the Peace Palace at The Hague; and \$850,000 for the grounds and buildings of the Pan-American Union at Washington. He was made a Commander of the Legion of Honor of France in 1907, and in 1911 received the peace medal of the Fourth International Congress of American States. See PEACE CONFERENCE, INTERNATIONAL.

Carnegie as Author. As a writer, Carnegie expressed himself vigorously in denunciation of war, and his works, *The Gospel of Wealth*, *The Empire of Business*, and *Problems of To-day*, have had international reading. He also wrote an *Autobiography*.

CARNEGIE, PA. See PENNSYLVANIA (back of map).

CARNEGIE CORPORATION. See EDUCATIONAL FOUNDATIONS.

CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE. This is probably the most practical of the many organizations striving to banish war from the world. It does not rival or supplant any other institution, but endeavors to coöperate with and aid all peace-promoting organizations. In addition, it is active in educating nations to greater friendship for each other. The income from its fund of \$10,000,000, given by Carnegie in 1910, is administered by a board of trustees, of which Elihu Root was the first president. It has three active divisions, those of economics and history, of international law, and of intercourse and education. The first two are primarily for research, the last for spreading the information which they gain and for promoting international good will. Noteworthy service was rendered to the government during the World War, and at its close, important data presented at the Peace Conference were prepared by the organization. See EDUCATIONAL FOUNDATIONS.

CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING. The proceeds of the fund of \$27,000,000 given to this organization by Carnegie between 1906 and 1918 are distributed in pensions to teachers (and their widows) in the United States, Canada, and Newfoundland, on their retirement from the faculties of universities, colleges, and technical schools. By dealing only with those schools which will bring their admission requirements and standards of teaching up to a specified level, the administrators of the fund have beneficially influenced the quality of higher education. Some opposition has been met from strictly denominational schools, which are not included in the benefits of the Foundation, and from others which object to certain requirements as to their policy of government. An educational research fund of \$1,250,000 was added by Carnegie in 1913.

The Foundation takes cognizance of institutions rather than of individuals. When a college or university has conformed to the definite standards which the Foundation sets, that school is placed on its accepted lists. Teachers and officers of such schools are then entitled to consideration for retirement allowances, under fixed rules as to length of service and age. The funds of the Foundation are in the hands of twenty-five trustees.

CARNEGIE HERO FUNDS. These gifts of Carnegie are for the financial support of those incapacitated for work, either temporarily, or permanently, because of heroic at-



CARNEGIE HERO-FUND MEDAL
(Panel designed to receive inscription)

tempts to save human life, and for the aid of widows and orphans of heroes. Medals of three classes are given. The original fund of \$5,000,000, set aside in 1904 for the United States, Canada, and Newfoundland, has been supplemented by similar gifts for Great Britain and Ireland, France, Germany, Switzerland, Belgium, Netherlands, Sweden, Norway, Italy, and Denmark. Military bravery is not recognized.

CARNEGIE INSTITUTE OF TECHNOLOGY. See PENNSYLVANIA (Education).

CARNEGIE INSTITUTION. This organization, founded in 1902 to encourage in the broadest and most liberal manner investigation, research, and discovery, and the application of knowledge to the improvement of mankind, has an endowment of \$27,900,000. The Institution offers no regular class work and no degrees. Its administration building is in Washington, D. C. The President of the United States, the Vice-President, the Speaker of the House of Representatives, the secretary of the Smithsonian Institution, and the president of the National Academy of Sciences are *ex-officio* members of the board, and the United States government guarantees the free use of its public records, museums, and libraries to all persons connected with the institution.

The organization has shown extraordinary breadth in its work of advancing scholarship, and has aided research on subjects as widely different as bacteria and the historical sources of Browning's poem, *The Ring and the Book*. It has brought to the attention of the world a

large number of scholarly men, and has rendered immense assistance to universities.

CARNEGIE LIBRARIES. Over \$60,000,000 was given by Carnegie to more than 2,800 libraries in English-speaking countries, and it is largely as the result of his beneficence that the public library has become a prominent institution in every community of importance in the United States and Canada. Cities which did not accept his aid were at least stimulated to better their libraries by the examples of their neighbors. Professional training for librarians has been encouraged. The type of architecture now almost standard for American public libraries owes its prominence to the activities of the Carnegie commission. In 1926 the original system was superseded by a plan for the improvement and expansion of library schools (see EDUCATIONAL FOUNDATIONS).

CARNELIAN, *kahr neel' yan*, OR **CORNELIAN**, a form of chalcedony (which see), usually of a clear, rich, reddish color, but sometimes yellow, brown, or white. It takes an excellent polish and is used in jewelry for seal rings, bracelets, necklaces, and other ornamental articles. One of the first stones used for carving, engraving, and ornamental purposes, it has also been prized as a charm Goethe says:

Carnelian is a talisman,

It brings good luck to child and man. T.B.J.

CARNIVOROUS, *kahr niv' o rus*, **ANIMALS**, the common name of the great order *Carnivora*, to which belong all the flesh-eating mammals. These animals are natives of all parts of the globe except Australia and New Zealand. They are divided into two main groups, *land carnivores* and *water carnivores*. The former group includes animals ranging in size from the tiny least weasel to bears weighing over 1,000 pounds. The most important families are the cats (including lions, tigers, leopards, etc.), civets, hyenas, weasels, dogs, bears, and raccoons. The water carnivores are made up of the eared seals, walruses, and true seals. There is one extinct land family, the saber-tooths, ancestors of the modern cats. While the typical carnivores are flesh-eaters, there are some which eat both flesh and vegetable foods, and some which are largely vegetable-eaters, as the bears. Excepting the bears, all walk on the under surface of their toes. There are never less than four toes to each foot. Many have sharp claws, heavy hair, and strong, agile limbs. But all of them have large, strong teeth, with sharp cutting edges, enabling them to cut and tear flesh food with ease. Although many carnivorous animals are beasts of prey, others are beneficial to mankind, for they feed on mice, gophers, and insects. They are hunted mainly for sport, but some are valuable for their fur. M.J.H.

Related Subjects. To the student who wishes to gain an idea of the number and variety of these flesh-eating mammals, the following list of references will be useful

Aard-wolf	Newfoundland Dog
Airedale Dog	Ocelot
Badger	Otter
Bear	Ounce
Bloodhound	Panther
Bulldog	Pekinese Dog
Cat	Pointer
Cheeta	Polecat
Chow	Police Dog
Civet	Poodle
Collie	Pug
Coyote	Puma
Dachshund	Raccoon
Dingo	Ratel
Dog	Retriever
Ermine	Sable
Eskimo Dog	Saint Bernard Dog
Ferret	Scotch Terrier
Fox	Seal
Foxhound	Serval
Fox Terrier	Setter
Fur and Fur Trade	Shepherd Dog
Great Dane	Skunk
Greyhound	Skye Terrier
Hound	Spaniel
Hyena	Spitz
Ichneumon	Staghound
Jackal	Terrier
Jaguar	Tiger
Leopard	Vampire Bat
Lion	Walrus
Lynx	Weasel
Marten	Whippet
Mastiff	Wild Cat
Mink	Wolf
Mongoose	Wolverine

Zoology

CARNIVOROUS PLANTS, the name given to those plants that lure insects and use them as food. They are also known as insectivorous plants. Carnivorous plants usually inhabit moist places where they obtain little or no nitrogen from the soil, and they must therefore secure it in some other way. In their case the decomposing bodies of insects provide the necessary material. These plants are equipped with organs to capture the insects, and glands that excrete a digestive fluid whereby the food is assimilated. Many of them have flowers colored in such a way as to appear at a distance like decaying meat—a feast in store for the hungry victim. Various devices have been developed by these plants as traps. The pitcher plants have tube-shaped leaves that hold rainwater in which the insects drown. Rosettes of leaves provided with sticky hairs are borne by the sundews. When an insect is caught by the hairs, the leaf margins curl around it. Venus's flytrap is equipped with leaves that work like a steel trap. In fact, the carnivorous plants are so efficient in their methods of entrapping unwary creatures of the animal world that they seem almost to have human intelligence. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles

Bladderwort	Butterwort	Sundew
Botany (page 800)	Pitcher Plants	Venus's Flytrap

CARNOT, *kahr' no'*, MARIE FRANÇOIS SADI (1837-1894), a French statesman, President of the French republic from 1887 to 1894. He was educated as an engineer and advanced rapidly in his profession, until he was appointed prefect of the lower Seine during the siege of Paris, in 1871. When, after the close of the Franco-German War, the French people reorganized the government and established a republic, Carnot took an active part in the nation's councils, and held public office without interruption until his election as President of France to succeed Jules Grevy (which see). He commanded the highest respect for his character and ability; the Panama Canal scandals, which occurred during his term of office, did not reflect on his honor. During a celebration, he was killed by an anarchist.

CARNOTITE. See RADIUM; COLORADO.

CAROB, *kair' ob*, a useful pod-bearing plant found in a wild state in all countries bordering the Mediterranean. It grows somewhat like an apple tree. The foliage is dark green and evergreen; the flowers, insignificant. The pods, brown, leathery, and from four to ten inches long, are the most valuable part of the plant, for they contain a sticky pulp which tastes like manna. They are used as forage for horses and cattle, and sometimes as food for man. The brown, shiny, beanlike seeds are of no value. Carobs have been called *locust* and *Saint John's bread*, from the belief that they were eaten by John the Baptist in the wilderness. They are also thought to be the husks referred to in the parable of the Prodigal Son. The carob is not the same as the American locust, although it is somewhat similar and is an excellent shade tree. It has been introduced with some success into the Southern United States and Florida. B.M.D.

Classification. The carob belongs to the family *Leguminosae*. It is classed as *Ceratonia siliqua*.

CAROL, *kair' ol*, a song of rejoicing which forms a part of the celebration of the great festivals of the Christian Church, but associated most commonly with Christmas. The first Christmas carol, recorded in *Luke II*, 13-14, was sung by the heavenly chorus of angels over the plains of Bethlehem, and some of the most beautiful carols ever written, such as Nahum Tate's *While Shepherds Watched Their Flocks by Night*, and Charles Wesley's *Hark! the Herald Angels Sing*, were inspired by this old, sweet story. Carol-singing was very popular in Europe in the Middle Ages, and still is a special feature of the Christmas season in England, where bands of men and boys go about the streets for several nights before Christmas, singing in the open air. In some American cities, this custom has been adopted as a part of the Christmas Eve celebration.

Dinah M. Craik's familiar Christmas song, a special favorite in England, has the simplicity and picturesque charm of many of the older carols:

God rest ye merry, gentlemen; let nothing you dismay,

For Jesus Christ, our Saviour, was born on Christmas Day.

The dawn rose red o'er Bethlehem, the stars shone through the gray.

When Jesus Christ, our Saviour, was born on Christmas Day

God rest ye, little children; let nothing you affright,
For Jesus Christ, your Saviour, was born this happy night;

Along the hills of Galilee the white flocks sleeping lay,
When Christ, the Child of Nazareth, was born on Christmas Day.

CAROLINA FOLK PLAYERS. See **DRAMA** (Modern Tendencies).

CAROLINA POPLAR. See **COTTONWOOD**.

CAROLINE ISLANDS. See **PACIFIC ISLANDS**.

CAROLINGIANS, *kair o lin' je anz*, the second line of Frankish kings, whose name is derived from that of the most illustrious member of the house. Charlemagne, or Charles the Great. The Carolingians were the immediate successors of the Merovingian line, the declining strength of the latter house being the occasion of their rise to royal power. In the seventh century, the weak Merovingian kings gave the real governing power to officers called mayors of the palace, the most famous of whom was Charles Martel. His son Pepin, or Pippin the Short, was crowned king of the Franks in 751, which marked the formal beginning of the Carolingian dynasty. The height of its fame and power was reached in the reign of Charlemagne, son of Pippin, whose conquests expanded the kingdom into a great empire.

Charlemagne's son divided his empire among his three sons, and at his death (840) his son, Charles the Bald, became king of the part of his territory which corresponds to modern France. The successors of Charles were weak and incompetent, and the dynasty came to an end with Louis V, who died in 987. The Carolingian was succeeded by the Capetian dynasty.

Related Subjects. The reader is referred in these volumes to the following articles:

Capetian Dynasty
Charlemagne
Charles (France)

Charles Martel
Merovingians
Pepin

CAROTIN, *kair' o tin*, a coloring matter. See **CARROT**.

CARP, a fresh-water fish, originally from Asia, but now found in most parts of the northern hemisphere. It was introduced into the United States by the Fish Commission in 1877, and has multiplied enormously, especially in the waters of the Mississippi Valley. The carp eats all sorts of animal and vegetable

matter, and is useful in keeping streams and ponds clear of refuse, but is a menace in that it destroys the eggs and breeding places of more valuable fish. Curiously enough, its spread has been aided by sportsmen, who often have

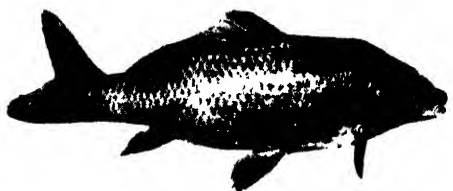


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THE CARP

Our plenteous streams a various race supply,
The bright-eyed perch with fins of Tyrian dye.
The silver eel, in shining volumes roll'd,
The yellow carp, in scales bedropp'd with gold,
Swift trouts, diversifed with crimson stains,
And pikes, the tyrants of the wat'ry plains.

—Pope: *Windsor Forest*.

one in their live bait and throw it into the lake after the day's sport. Though carp flesh is not relished by most Americans, it is prized in Europe, and large quantities are consumed in populous American cities. Carp vary greatly in size, and large specimens may weigh thirty pounds or more. Three varieties are common. *scale carp*, evenly covered with scales; *mirror carp*, with larger, irregular scales; and *leather carp*, with only a few scales, much of the skin being bare.

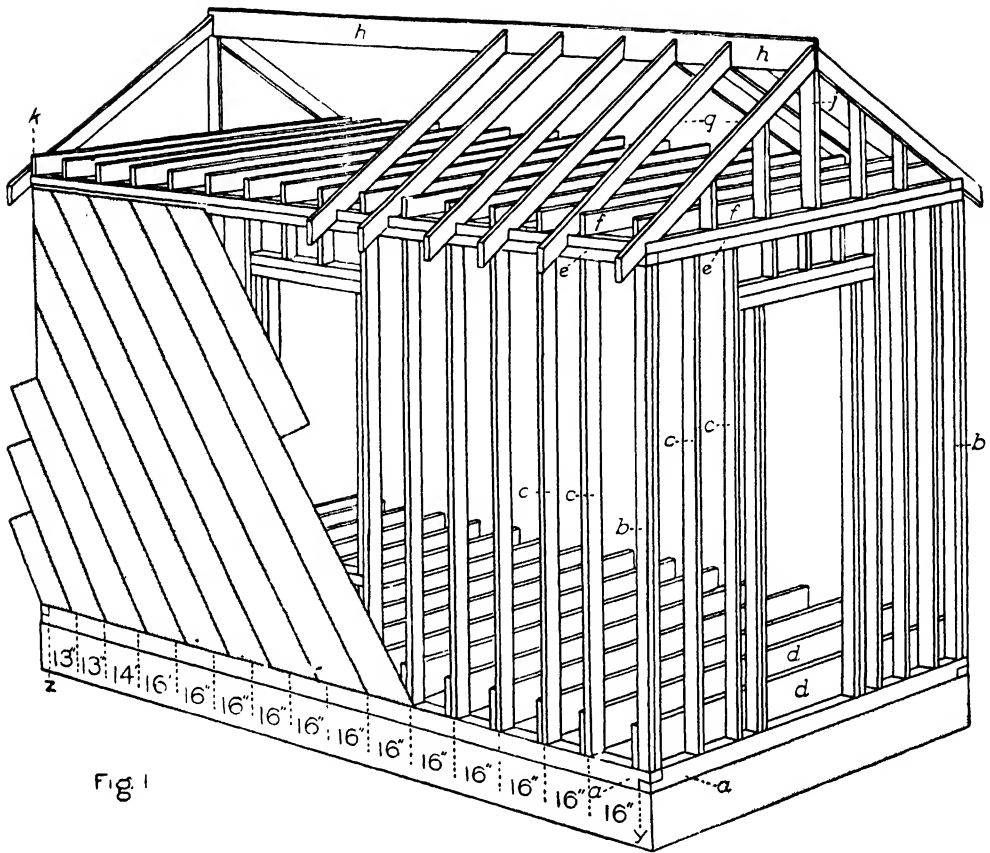
L.H.

Scientific Name. The carp is a close relative of the goldfish, as well as of most of the small fishes of the lakes and streams that we call "minnows." Its scientific name is *Cyprinus carpio*.

CARPAL BONES. See **HAND**.

CARPATHIAN, *kahr pa' thi an*, **MOUNTAINS**, an important mountain system in Europe, extending about 800 miles in a semi-circle from the Danube River near Pressburg to Orsova, also on the southern bank of the same stream. It is the eastern extension of the great Central Europe mountain system. The mountains are not covered with perpetual snow, even in their highest altitudes, and glaciers are entirely absent. They are noted for the richness of their deposits of gold, lead, silver, and copper, and many mines have been worked for centuries. The lower slopes are covered with forests of fir, oak, and beech, in which roam wolves, lynxes, and bears. The ranges of which the system is composed all lack the lofty grandeur of the Alps, the highest point, Gerlsdorferspitze, being only 8,737 feet above sea level.

During the World War, fierce fighting took place each year in the passes over the ranges, and it is estimated that as many as 500,000 men were killed and buried in the



mountain chain, which was alternately held by Russians and Austrians.

CARPEAUX, *kahr po'*, JEAN BAPTISTE. See SCULPTURE (France).

CARPENTARIA, GULF OF. See QUEENSLAND.

CARPENTER, FRANK GEORGE (1855-1924), an American traveler, newspaper writer, and authority on geography, whose letter-writing tours for various American journals took him into nearly every quarter of the globe. He was born at Mansfield, O., and was educated at the University of Wooster in that state. Beginning his career as a legislative correspondent for the *Cleveland Leader* in 1870, he was not long in broadening his field, and in 1888-1889 made a trip around the world for a newspaper syndicate. Thereafter he visited almost every part of Europe, Asia, Africa, and South America. He reported the Mexican revolution of 1913, and wrote also of life and conditions in Cuba, Central America, the Panama region, and Canada.

Distinctive Books. Carpenter's *Geographical Readers*, with their vivid descriptions of the author's personal observations, written in a popular style, became favorites in the common schools. Equally successful were his *New Geographical Readers and World*

Travels. An industrial series for children, comprising *How the World is Fed*, *How the World is Clothed*, and *How the World is Housed*, are easy to understand and are full of useful information.

CARPENTER BEE. See subtitle, in article BEE.

CARPENTER'S HALL. See PHILADELPHIA
(Historic Buildings).

CARPENTRY, *kahr' pen trie*. What boy or man is there who does not truly like to work with hammer and nails and saw? Most men are too busy at other things to be able often to indulge their tastes in this direction, but when they have the opportunity, they thoroughly enjoy a little carpentry. As for boys, the desire to fashion things, large or small, useful or ornamental, or neither, is a part of their very being.

How a Carpenter Builds a House. It will be seen from the following description of a carpenter's work that he is something more than a mere driver of nails. In a small way, he is an architect and an engineer, and along certain lines, a mathematician. Of course he must also be skilful with his tools, but a first-class carpenter is even more active with his brains than with his hands.

The Frame. A wooden house is built around a skeleton called the frame, of which there are two types, the *braced frame* and *balloon frame*. The former is a complete structure in itself; the latter depends upon the boards of the walls and floors for bracing against winds and other stresses. The braced frame is very seldom built in the United States and Canada, and only the balloon frame is here described.

In Fig. 1 is shown the frame of a small one-story gable-roof house, and the following paragraphs tell exactly how it is constructed. By carefully studying both the pictures and the text, anyone with a taste for carpentry should be able to build correctly any simple type of house.

In the following paragraphs, a description of the parts is first given, in order that a clear idea may be had of their relation; afterward is told the usual order in which they are put together:

Sills. These are marked *a a* in Fig. 1. In the present instance they are 4"x4", and the exact length of the sides of the house. (Explanation. ' indicates foot or feet; " indicates inches.) For a longer house it would be necessary to join and spike two timbers. Fig. 2 shows how this may be safely done. The sills are joined at corners as in Fig. 3, and spiked. If the house is built upon a concrete foundation, a bed of lime mortar is spread over the top of the latter, and the sills set in it with their edges an inch from the outside. If the building will be subjected to high winds, bolts are imbedded in the concrete while it is being made, and the sills fastened as in Fig. 4.

Corner Posts. The uprights, *b b* in Fig. 1, are of two 2"x4", spiked together. They should be about 8" longer than the distance desired between ceiling and floor. Thus, a house of this type with a ceiling 7' 4" high has an 8-foot post.

Studs. These are indicated by *c c* in Fig. 1, and are 2"x4". The distance between them must be so arranged that if the house is plastered, the ends of the laths, which are 48 inches long, can be nailed to them, therefore they are usually placed either 16" or 12" from the center of one to the center of another. Study of the spacings along the side (*y* to *z*) will show

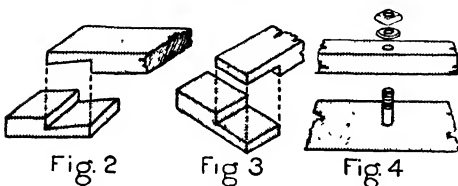


Fig 2

Fig 3

Fig 4

how to space the other walls. It will be noticed that the first center is measured from the edge of the corner post, and that the unavoidable spaces of odd size are all made at one end of the wall, so that few laths need to be cut.

Joists. The floor beams, or joists, *d d* in Fig. 1, are 2"x8". In houses of longer span, the larger dimension of the joists should be increased one-half inch for every foot of length beyond twelve. They are set beside the studs and corner posts, and spiked to them as well as to the sills. To make their tops

level, they are notched on the under side, as in Fig. 5. Additional strength may be gained by bridging (Fig. 6).

Plates. The horizontal timbers (*e e* in Fig. 1) are double 2"x4", like the corner posts. They are joined at the corners in a manner similar to the sills (Fig. 3). Gable houses are sometimes built without the plate at front and back, the studs continuing to the rafters.

Ceiling Beams. These are shown at *f f* in Fig. 1, and are 2"x4". For longer spans they should be 2"x6". Because laths are nailed to them, they are

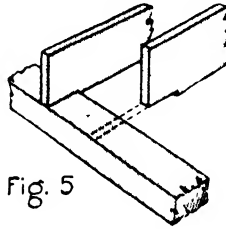


Fig 5

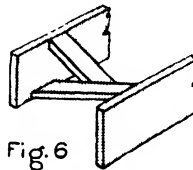


Fig 6

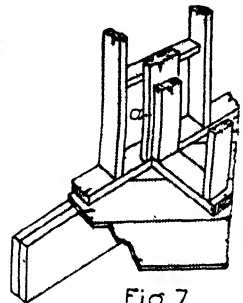


Fig 7

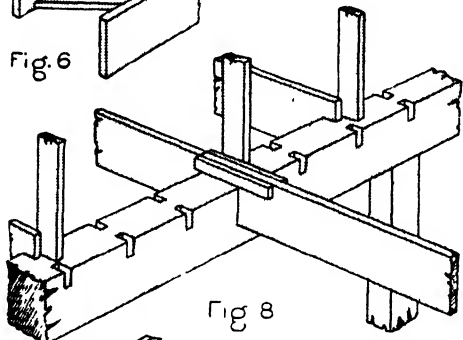


Fig 8

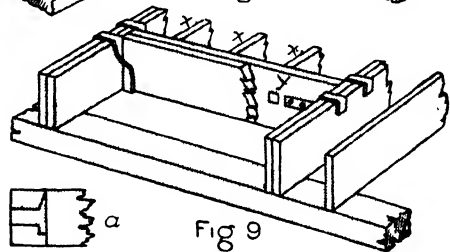


Fig 9

[In common practice to-day, the somewhat intricate details of Figs 8 and 9 are no longer employed; simpler joints are deemed acceptable.]

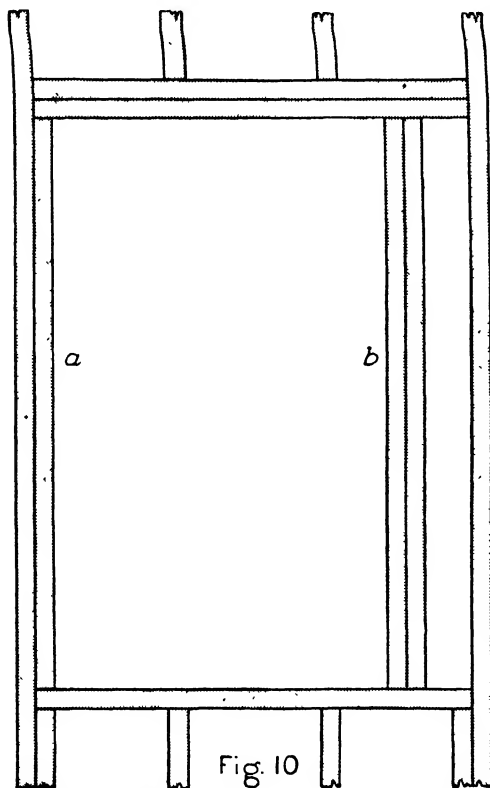
directly above the studs, with an additional one close to the plates at each end. Their projecting corners (*k*) will have to be sawed off before the roof is put on.

Rafters. These timbers, marked *g g* in Fig. 1, are spaced about 2 feet apart, the outside edge of the first pair being flush with the outside of the plate. Directions for measuring and cutting rafters are given below. The ridge board *h* is an inch thick and about 6 inches wide, and cut as shown in Fig. 14.

King Post. This is marked *j* in Fig. 1. The short studs beside it are cut as explained below, under *Cutting the Rafters*. They are spaced 2 feet on centers.

Partitions. The frame of a partition is of 2"x4" vertical studs resting on a 2"x4" and crowned by a 2"x4". A partition running parallel with the joists should be set on two 2"x8" joists (Fig. 7). In a small house, a partition at right angles to the joists may safely rest on them, but in a building of larger span, posts and a beam should be added, as in Fig. 8. Unless there is a cement floor to the cellar, the posts should be set in the ground a few feet. Care must be taken that there is a space at the edge of every partition, to which laths can be nailed. Fig. 7 (a) shows how this may be effected.

Window Openings. These are framed with double 2"x4"'s at top and side, as in Fig. 10. In some cases a stud may form part of a side, as at *a*; but usually at least one side must be like *b*. An opening should be about 2 inches longer than the finished window frame, and about 7 inches wider (unless the window is hung without weights, in which case the opening is only 2 inches wider).



Door Openings. These should be 3 inches higher than door frames and 6 inches wider. They are framed above and at the sides like windows.

Openings for Chimneys, Cellarways, Etc. Horizontal openings are framed as in Fig. 9. The joists *x x* should be fastened to the header *y* with *mortise and tenon* joist hangers, as shown at *a*, in addition to being spiked. None of the joists should come within 4 inches of the brick work of a chimney.

The Outside. The boards which cover the frame are *sheathing*; they are sometimes put on diagonally, because in this form they

give stronger bracing to the frame. They are sawed to the proper length after being nailed, as in Fig. 1. The best sheathing is tongue and groove, but common boards of the best grade are suitable where warmth is not important.

Building Paper. One or two thicknesses of paper are put on over the sheathing, and these should be carefully brought around all corners and edges of openings, to keep out wind. See Fig. 16.

Siding. The outer covering is laid horizontally, commencing at the bottom. Beneath the siding are the two pieces *a* and *b* in Fig. 12, which form a *water table*.

Roofing. The roof is usually covered with common boards, laid two inches apart except at the eaves, where they are close together.

Corner Boards. These finishing boards are nailed vertically over the siding, or they may be nailed through the paper on to the sheathing, and the siding butted against. If one corner board is 4 inches wide, the other should be 5, as in Fig. 11.

Shingles. Each row of shingles covers all of the row below it except 4 to 6 inches. The row at the eaves should slightly overhang the last board, and be double, as in Fig. 15. As each row is laid, a board is temporarily nailed to the roof, with its upper edge marking the location of the next row. Care should be taken to see that no joint between two shingles is directly above one in the row below. Very broad shingles should be split. Two nails placed about two inches above the exposed portion will hold the ordinary shingle. Fig. 14 shows a method of making the ridge water-tight.

Eaves. The edge of the roof may be finished in many ways, which can best be learned by examining finished houses. Metal eave-troughs, or gutters, may be attached either before or after shingling.

The Inside. *Floors* are usually double, as in Fig. 12. The lower layer is of plain or matched boards laid diagonally so that their shrinkage will not cause cracks in the upper layer of finished flooring. The latter is *blind-nailed*, as in Fig. 13. Where the end of a diagonally cut board will be unsupported, a small strip *c* (Fig. 12) should be fastened.

Walls. If plaster is to be applied, walls and ceilings must first be covered with laths set horizontally about 4-inch apart. Remember always to have a nailing strip for the end of every lath. In place of plaster, the walls may be finished with composition board or with V-joint lumber, blind-nailed.

Baseboards are attached as shown in Fig. 12. With V-joint they may be omitted and the angles filled with *quarter-round*, which is like a quarter of a small cylinder.

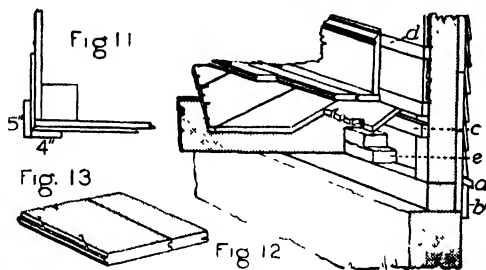
Windows. All the details of a window are shown in Fig. 16. Most of the parts come from the mill already cut in proper sizes. In the picture, *a* is the space for the pulley weights, *b* is a ground strip like *d* in Fig. 12, and *c c* are trim. A very good rule for windows is that there should be a square foot of glass for every 100 cubic feet of interior space to be lighted. Before commencing a building, it will be well to find out if the size of window desired is in stock at the local planing mill.

Doors. Both frames and doors are usually purchased ready made. A common size of door is

2' 8"x6' 8"x1 $\frac{1}{2}$ ". Inside doors are set high enough to swing over carpets, and a threshold is put underneath them in the door frame. The details of door-hanging can best be learned by examining doors already in use.

Filling. Where cold winds are frequent, it is advisable to fill spaces between joists with old bricks or odds and ends of 2"x4", as at *e* in Fig. 12. Openings between rafters at the plate may also be blocked.

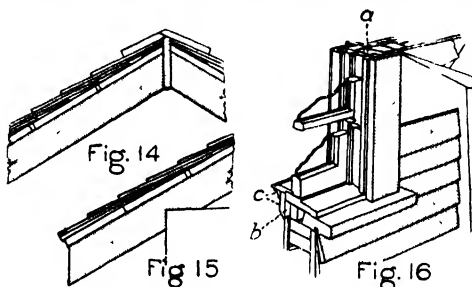
Cutting the Rafters. Because of the diagonal cuts in rafters, their measurement is more difficult than that of other parts of the frame.



In actual cutting, the steel square is used, but before building commences, the length of rafters can best be estimated by a graphic drawing, as in Fig. 17. On a large sheet of paper, draw a line *ac* to represent the plate, using a convenient scale, say $\frac{1}{4}$ of an inch to the foot. If the roof is to be $\frac{1}{2}$ pitch (see Roof), the perpendicular line *bd* at the center will be $\frac{1}{2}$ *ac*. Now draw the lines *ba* and *bc*; their measurement gives the length of the rafters from ridge to edge of plate. If the rafters are to be notched to the plate for half their thickness, this will be the measurement along their center, as will be seen from Fig. 18. Do not forget to add to the length of the rafter thus found the distance which you wish it to project beyond the plate. The distance *ad* is called the *run* of the rafter; the distance *bd* its *rise*.

A steel square has a scale of inches on each outer edge, besides scales of various other sorts and tables which cannot be explained here. To measure a common rafter like the one in the house illustrated, the inch scales are

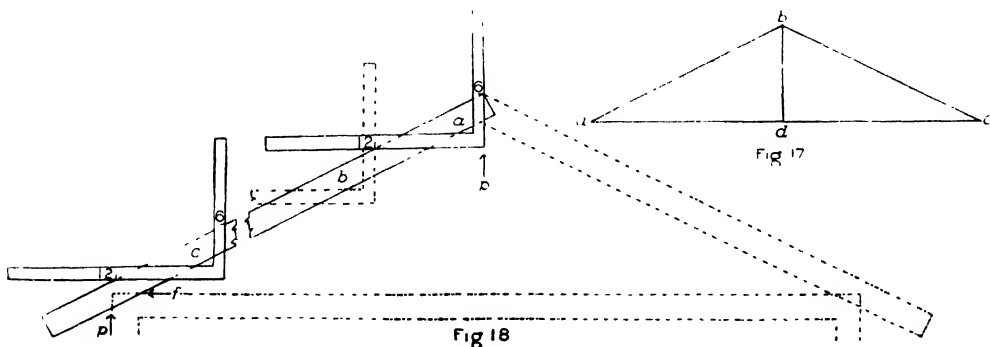
used. In the present instance, the rafter has a *run* of 6 feet and a *rise* of 3 feet, and in one foot of run will rise 6 inches. Lay the square on the edge of a 2"x4", with the 6" mark of one arm and the 12" mark of the other in, as at *a* Fig. 18. Mark along the line *p* for the *plumb cut*, but in cutting the rafter later, remember to allow a half-inch for the ridge-board. The dotted lines are added to show what part this rafter will occupy in the finished frame. Now mark where the 12" line



rests, and move the square so that the 6" mark rests on this point, as in position *b*. In the sixth position of the square (*c*), the 12" mark will be at a point directly over the edge of the plate. Move the square to the seventh position and mark the plumb cut of the notch. The foot (*f*) will be at right angles to it.

In cutting the studs between the plate and the gable, remember that a stud one-third of the distance between the edge of the plate and the king post will be one-third as high as the latter. To cut the upper edge of one of these studs, mark a rise of one inch, one-half its width.

Construction. In erecting a house, make frequent tests with a level. Set the sills in place first, level them, and be sure that their corners are square. Next lay and level the joints; to make certain that their tops are all at the same height, lay a long board across them to hold the level. Set the corner posts in place, using the level to make sure that they are perpendicular. They may be held in position by temporary braces. Some car-



penters nail the plate to the studs before putting the latter in place, but this makes a heavy wall to lift, and for amateurs it may be better to nail the plate to the corner posts first, setting up the studs one by one. The window and door openings are not sawed until after the frame of studs is all up, and it is often convenient to lay the rough flooring first, so that the carpenters can walk about. Rafters should not be erected until the ceiling beams are spiked in place, or their weight will spread the walls apart. Enough of the sheathing to hold the frame in the position in which its members have been found to be level and perpendicular should also precede the rafters. The end rafters and the ridge board, which should be leveled with special care, are put in place before the intermediate rafters. Window and door frames are set before siding. The order of construction of the rest of the house is a matter of convenience.

To mark the positions of the siding, cover a piece of strong twine with chalk, stretch it along the line for the top of a piece of siding, and snap it against the wall; it will leave a distinct mark on the building paper.

Nails should be large enough for strength, but never of a size that will split the wood. For names of different sizes of nails, see the article on that subject.

The only hardware necessary for the building will be locks and hinges. Small pieces of tin, called *flashing*, must be placed where the chimney is built through the roof, to prevent the leaking of water into the house. C. A. C.

CARPETBAGGERS, *kahr' pet bag urz*. After the close of the War of Secession, nearly all the whites in the Southern states were deprived by Congress of the privilege of voting, because they had taken part in the rebellion against the government. This condition was taken advantage of by unscrupulous politicians and adventurers from the North, who took up a temporary residence in the Southern states that they might control the negro vote and be elected to office. The name comes from the old-fashioned traveling bag, which was made of carpet with leather mountings. The carpet bag suggested the temporary character of the residence of these Northern adventurers. The state governments administered under these conditions were of the worst sort imaginable; enormous taxes were levied, and the money was frequently spent in extravagance and speculation, leaving the states burdened with debt. See RECONSTRUCTION.

The name is also sometimes applied to those Northern politicians who, before the war, took up their residence in the South with a view to representing those states in Congress.

CARPET BEETLE, sometimes called **BUFFALO BUG** or **BUFFALO MOTH**, a troublesome beetle about one-eighth of an inch long, marked

with black, white, and red. Its eggs are laid on carpets and woolen garments, and the larva, a short, brown, hairy grub, feeds on these articles. This beetle and its young are difficult to remove. The best preventive is the use of rugs instead of carpets on hardwood floors, and the careful storing of garments not worn in the summer. Many of the precautions used against clothes moths (see **MOTH**) will be helpful, except that carpet beetles are not affected by camphor, moth balls, and other repellents. Fumigation of storage boxes and closets with paradichlorobenzene is a desirable measure. This chemical is now successfully used by peach-growers to eradicate the larvae of the peach borer. It is non-inflammable, and the fumes are deadly to insects. Tobacco dust placed under rugs will help to keep the insects out. Regular use of a vacuum cleaner will also prevent damage. See **BETTER**. W. J. S.

Classification. The common carpet beetle is classed as *Anthrenus scrophulariae*, order *Coleoptera* (see **BETTER**).

CARPETS AND RUGS, textile coverings for the floor. The Latin word *carpita*, from which the name *carpet* is derived, really means *rug*, but at the present day a carpet is regarded as distinct from a rug. The difference lies in the fact that a carpet is used to cover the entire floor surface of a room, while a rug covers only a part. Also, while most rugs are woven all in one piece, carpets are usually made up of strips of varying width sewed together, to fit the sizes of rooms.

Antiquity of Carpets. Carpet-making and rug-weaving by hand have for centuries been Oriental arts, and it was not until the nineteenth century that machinery was employed to meet the growing demand for floor coverings. In ancient times, even in the remote days when our ancestors dwelt in caves and lived by hunting, it is probable that their rude dwellings were made more habitable by the use of skins for rugs and for hangings at entrances. Couches were no doubt made of skins, and it would be only natural that if the supply were sufficient more should be placed on the ground or floor of the cave. Thus it is certain that the first floor covering was a rug, and not a carpet, in the modern sense of the word. Gradually the use of skins was extended to coverings for seats, and as soon as the art of weaving was discovered, textiles began to take their place.

That carpet-making is of very ancient origin is proved by the fact that there are still in existence carpets known to have been made nearly 1,500 years before the Christian Era. The palaces of the Pharaohs of Egypt were decorated with carpets and rugs, and these were also used in the temples.

How Carpets and Rugs Are Made. The

methods employed in weaving Oriental rugs are the same now as they were centuries ago. On a wooden framework, its size depending on the length and width of the carpet or rug to be made, are stretched threads of hemp, cotton, wool, or silk, to form the *warp*, or foundation. To these threads are knotted tufts of wool, silk, camel or goat hair, or mixtures of those materials. The ends of the knotted pieces are allowed to protrude, all on the same side of the warp. After a row of such pieces has been added, a thread of the same material as the warp is run in alternately over and



Photo Visual Education Service

IN TUNIS, NORTH AFRICA

The illustration is that of a school in which rug-weaving is exclusively taught

above the warp threads. The knots and weft thread are pressed tightly together by means of a blunt comb. Row after row of knots and weft thread are added, until the desired size is obtained. On the number of knots in a square inch largely depends the value of the carpet. In some carpets, the number may be 200, or even fewer, while in others there may be as many as 750 knots to the square inch. Such weaving is, of course, a very slow process, and often the work of several weavers for more than a year is required to complete one carpet.

In Eastern countries, most of the weaving is done in the homes of the people, and the patterns woven are sometimes handed down in the family for generation after generation. Throughout the East, the method of weaving is the same, with variations only in the form of knot tied and in the patterns used. Rugs and carpets produced in Mohammedan countries have patterns of geometrical design only, as the laws of the Koran forbid the reproduction of the image or likeness of any living thing.

Modern Carpets. Back in the early part of the nineteenth century, careful housewives preserved any discarded fabrics; these were later cut into long, narrow strips, and they were sewed together into carpets; the work was done either by themselves or by local or traveling carpet-makers. In time, practically all women in the home wove their own rugs; many produced patterns of most striking originality. In some of the more rural sections, it is quite possible that rugs are still being woven in this crude way.

It was not until after the Revolutionary War that carpets were woven in the United States in a factory established specifically for the manufacture of rugs and carpets. About this time, too, a Frenchman named Jacquard

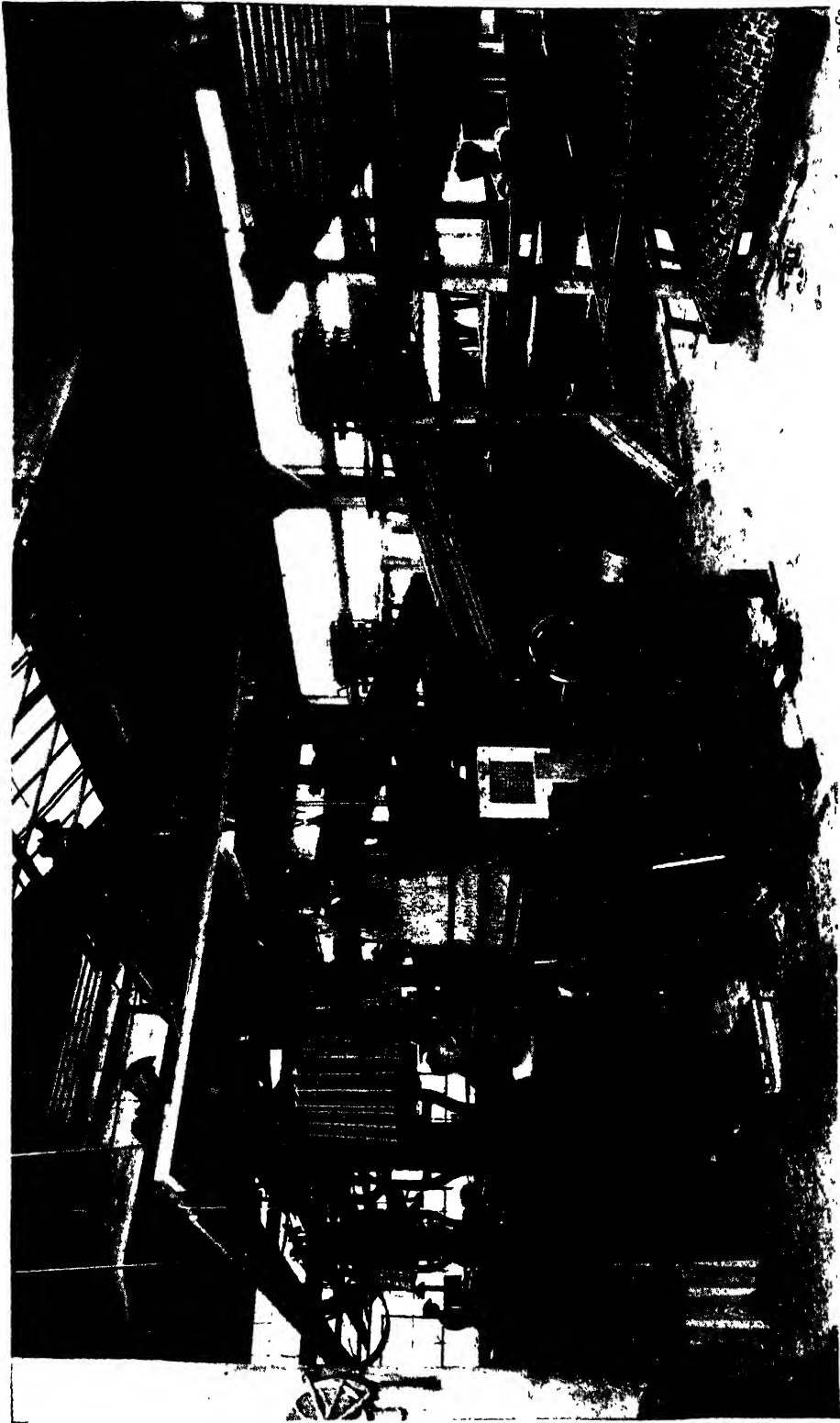
invented an attachment for the hand loom, which as perfected, has brought within the means of all a type of floor coverings that for quality and appearance leaves little to be desired. The Jacquard, as it is termed, is attached to the loom, and it unerringly selects the various colored yarns required to form the pattern, by means of a perforated cardboard which

has much the same appearance as our modern music roll. This system makes it possible for the present-day rug manufacturers to reproduce century-old masterpieces in all their exotic coloring and intricate design.

There was no great change in the method of weaving until 1841, when Erastus Bigelow perfected the first power loom in America. This greatly reduced the cost of production by making it possible to produce by machinery in one day what had previously required many weeks to do by hand. To-day in all Western countries, the power loom has entirely replaced weaving of carpets and rugs by hand. It would be difficult to imagine a more perfect machine than the Jacquard loom, on which all Wilton rugs are woven. Perfected to such a degree that faithful reproductions can be made of practically any design, regardless of how intricate the pattern or how many colors it may contain, the Jacquard makes possible not only rugs of rare beauty, but scores of other fabrics, such as velour, mohair, and tapestries.

Modern Qualities. Rugs and carpets are divided into a number of grades—Wilton, Axminster, velvet body Brussels, tapestry, and chenille. Though there are two grades of Wiltons, worsted and wool, the difference lies in the quality of yarns and closeness of weave, rather than the type of construction.

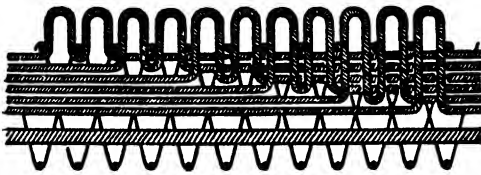
Wilton and Body Brussels. Both are woven in practically the same manner, on Jacquard looms. Both are made of skein-dyed yarns. The yarn is continuous, approximately one-sixth of the strands or tufts appearing on the



Courtesy Olson Rug Co.

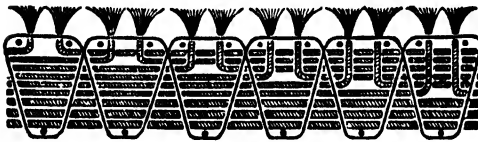
A Modern Carpet and Rug Machine. Here a Wilton rug is in the making. The machine which the man is operating, with the five fan-shaped frames to the rear, constitutes the Jacquard loom. The pattern cards resembling a music roll are suspended above the operator's head. The frames to the rear of the machine contain the many thousands of spools of yarn that are required to weave the Wilton.

surface to form the pattern, the balance being "buried" in the back to give strength, thickness, depth, and resiliency to the fabric. The illustration shows a section of what is termed



SECTION OF SIX-FRAME BRUSSELS CARPET

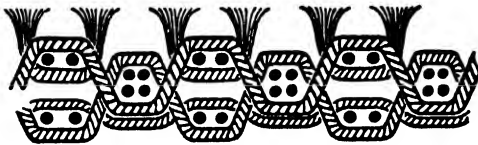
a six-frame Wilton; it clearly illustrates how each of six colors is brought to the surface and again imbedded in the back as required. In body Brussels, as shown by the illustration,



SECTION OF SIX-FRAME WILTON

each tuft or loop is left intact, instead of being cut, forming a ribbed surface instead of the thick upstanding pile found in Wiltons.

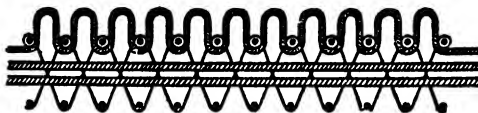
Axminsters. This is named after a town in England, where, early in the eighteenth century, the manufacture of pile carpets was started. In all Axminsters, the yarn is on



SECTION OF AXMINSTER WEAVE

the surface, each tuft standing alone, and is not a part of the body fabric or imbedded in the back, as in Wiltons. The back of Axminster is always of some other material, usually heavily sized to add weight.

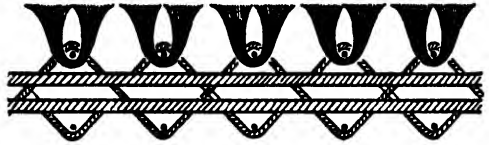
Velvet and Tapestry Rugs. These are woven practically in the same manner. In both, the yarn appears only on the surface, being bound



WEAVE OF TAPESTRY RUG

to the jute backing by linen or cotton threads, as shown in the illustration. Like Wilton or body Brussels, these two grades are skeindyed. Undyed yarn is wound upon a large cylinder; the design is printed on the yarn

before weaving in colors to form the pattern. Tapestry rugs differ only in that the loops are left intact, so that the entire surface con-



TAPESTRY OR WILTON VELVET WEAVE.

sists of thousands of small loops, as is shown in the illustration.

Chenille. In this fabric, the surface or pile is woven separately and then sewed to the back, the weaving of which is also a separate operation.

With the exception of one large manufacturer in Chicago, the rug industry is confined almost entirely to New York, Pennsylvania, and Massachusetts.

Varieties of Oriental Rugs. The art of making Oriental rugs is so ancient that it is difficult definitely to trace its origin. It is not very probable that the Egyptians improved the work of their predecessors; the similarity of the forms and designs found in modern Oriental rugs to forms and inscriptions of Egyptian architecture carries the art of weaving back to that ancient civilization. Rugs are written pages. In their apparently chaotic designs is a symbolic language, the key of which, through the passing of centuries, is all but lost. The Ispahan rug, with its gorgeous field of Ispahan red and varied floral designs, with a fine tracing of puzzling, fascinating lines, inaugurated a new era of rug-making. This rug is hardly in existence to-day, only a few perfect specimens and many fragments being preserved in private collections.

Oriental rugs of the present time are classified into six distinct groups—Persian, Turkish, Turkestan, Caucasian, Chinese, and Indian. Each group may be subdivided, the names of the rugs being derived from the various districts and towns in which they are made. Persia leads in the production of beautiful and costly rugs, and there are nearly twenty varieties of this class. The Kermanshah, Tabriz, Shiraz, Saruk, Sehna, Kurdistan, and Serape are among the finest weaves. Of the Turkestan family, the Bokhara, Khiva, and Samarkand are probably the best known. Ghiordes, Anatolian, Kiz-Kilm, and Hamidic are prominent names among those of the Turkish group, and Karabagh, Kazak, Cashmere, and Daghestan are familiar patterns in the Caucasian division. Chinese rugs form a distinct type, odd geometrical designs or unique varieties of the lotus flower being distributed on harmonious grounds of blue, red, or yellow. Some fine Indian rugs come from Tanjore and Benares. These are

usually distinguished by a medallion center. One of the most pronounced patterns in Oriental rugs is the *prayer rug*, which always accompanies the devout Mohammedan. Upon this rug he performs his devotions, his face and the point of the pattern being directed toward Mecca. Eastern rugs are the most durable and most valuable of all rugs; some have been in use for 300 years, and their prices run into thousands of dollars. Large rugs of fine weave have commanded a price as high as \$45,000; a rug nine by twelve feet may command a price of \$2,000, and one about two by three feet may cost from \$50 to \$150.

Antiquity of Rugs.

If one could look back through the many thousands of years in which rugs have been used, he would find all the elements of a fairy tale. For, centuries ago, Assyria, Chaldea, and Babylon, when at the height of their regal splendor, were probably the an-

cient homes of the rug. Historians tell us that rugs were used in the temple of worship, in royal palaces, by the nobility, and were placed before images of their idols and their gods. Probably even this period is not the true date of the origin of rugs, for, though we know considerable about their history to-day, it probably always will remain a subject for argument. But the mere mention of these ancient days must recall the antiquated methods of weaving that must have been in existence at that time. From the shearing of the sheep, by methods most crude, to the dyeing and the spinning, and finally the weaving, every operation was performed by hand and by methods so antiquated that they can best be described as ridiculous when compared to the present-day methods. O.F.D.

CARPET SWEEPER. See VACUUM CLEANER.

CARRACCI, OR CARACCI, kah rah' che, a celebrated family of Italian painters, the three leading members of which founded in Bologna, in 1582, a famous academy of painting, "the academy of those on the right road." Their school is known in the history of art as the *Eclectic School*, which means "a bringing to-

gether of the best points of various systems"; their object was to do away with the uninspired imitation of Raphael and Michelangelo which then prevailed, and to unite the special excellences of the great masters of the Renais-

sance—the drawing of Michelangelo, the color of Titian, the grace and symmetry of Raphael, and the light and shade of Correggio.

Ludovico (1555-1619), the eldest of the three Carracci, was born in Bologna. Later, in Florence, he came under the influence of Andrea del Sarto; in Parma, of Correggio; in Venice, of Veronese and Tintoretto. On his return to Bologna, he became associated with his two cousins, AGOSTINO (1557-1602) and ANNIBALE (1560-1609), in carrying out the program of their famous school, which may be regarded as the first modern academy of art.

Among Ludovico's important canvases are *Sermon of John the Baptist*, in the Gallery of Bologna, and *Conversion of Saint Paul*, in the Munich Gallery. He also painted a number of sacred frescoes. Annibale's *Madonna Appearing to Saint Luke and Saint Catherine* and *The*



Photo Asia Magazine

RUG-WEAVING IN PERSIA

This photograph was taken in Sultanabad, where most of the carpets of Persia are made. As they are manufactured for the general market, they are not of the highest quality.

Resurrection, both in the Louvre, are among his greatest achievements; his *Three Marys*, in Castle Howard, Yorkshire, England, is a wonderful example of pathos in art. The galleries of Paris, Leningrad, Madrid, Florence, and Rome contain specimens of his landscapes. Agostino was an engraver of first rank as well as a painter, and his engraving of Tintoretto's *Crucifixion* was preferred by that master to the original. A celebrated canvas is his *Last Communion of Saint Jerome*, now in Bologna. The famous fresco decorations of the gallery of the Farnese Palace, in Rome, are the joint work of Agostino and Annibale.

CARRAGHEEN, kair' a geen. See IRISH MOSS.

CARRANTUOHILL, kair an too' ill, the highest peak in Ireland (which see).

CARRANZA, kah rah'n' zah, VENUSTIANO (1860?-1920) a Mexican leader and general who was recognized by the United States and other nations, in 1915, as President of Mexico, although he styled himself "First Chief." Until the successful revolt against Diaz, in 1911, Carranza was one of the very rich landowners of Mexico, and he had occupied a high judicial position. This aristocrat was a friend of President Madero, who appointed him governor

of the state of Coahuila. Carranza refused to recognize the provisional government formed by General Huerta, and in March, 1912, after Madero's death, was acclaimed First Chief by the latter's adherents.

Carranza's career for the next few years was chiefly a record of civil war. In the districts over which he held sway, he preserved a fair



Photo Brown Bros

VENUSTIANO CARRANZA

measure of order, although several times he showed a complete disregard of the rights and wishes of neutrals, including the United States and its representatives. He proved himself, however, a capable soldier, and his armies succeeded in defeating those of Francisco Villa (which see), his chief rival. During the summer of 1915, Carranza became in fact ruler of all Mexico except sections in the north and in the south. This condition was accepted by the United States and leading South American republics as indicating Carranza's ability to bring peace to his country; therefore his government was formally recognized.

Villa, turned bandit, made trouble both for Carranza and the United States. Carranza for a time gave support to American troops sent into Mexico to capture Villa, but soon withdrew all help. In a new insurrection against his authority in 1920, he was assassinated.

Related Subjects. The reader is referred in these volumes to the following subjects:

Mexico (Civil War)
Obregon, Alvaro
Pershing, John J.

Villa, Francisco
Wilson, Woodrow
(Administration)

CARRARA MARBLE. See MARBLE.

CARREL, kair' el, ALEXIS (1873-), a French biologist and surgeon, famous for his experiments concerning the nature and processes of animal life. Dr. Carrel was born in France, received his professional training there, and first gained distinction as a surgeon at the University of Lyons. But it was in the United States, to which he migrated in 1905, that he carried on the experiments which made him world-famous and won for him the Nobel Prize in medicine for 1912 (see NOBEL PRIZES). As fellow of the Rockefeller Institution for Medical Research, a position he held from 1909 to 1914, he made some of the most important discoveries in the history of medicine and biology. He kept alive certain organs of

dead animals, and thus proved that many organs, such as the heart or the stomach, may live and carry on their functions even after the death of the body. Thus he proved a difference between general death, which ends the life of a distinctive animal or person, and elemental death, which ends the life of its tissues. These discoveries suggested the possibility that dead or defective organs could be replaced by sound, live ones. Dr. Carrel successfully transplanted veins and arteries, kidneys, and even blood vessels, all of which were kept alive in cold storage.

Not only has he kept separate organs alive, but he has kept alive separate cells apart from the organs of which they were once parts. He has demonstrated that these separate cells will grow independently of each other if they are given proper nourishment, and also that their growth can be stimulated from two to forty times by adding what he calls *tissue juice*. This juice is derived from the tissues of animals, and Dr. Carrel found that the juice of a certain animal produced quicker growth when applied to another animal of the same species than when applied to cells of any other species.

What He Wrote. Among his numerous scientific treatises are *The Preservation of Tissues and Its Application to Surgery*, *The Surgery of Blood Vessels*, *Results of a Replantation of the Thigh*, and *The Transplantation of Veins and Organs*.

CARRICK, PA. See PENNSYLVANIA (back of map).

CARRIER, COMMON. See COMMON CARRIER.

CARRIER PIGEON, OR HOMING PIGEON, a variety of domestic pigeon, which, because of wonderful flying powers and its love of home, can be trained to carry messages. As a matter of fact, the name "carrier pigeon" is technically applied to a bird no longer bred for carrying messages, but prized for exhibition. Both names are used for the homing pigeon, however, and the distinction between the two birds is one which is recognized in the main only by bird fanciers.

Carrier pigeons are larger than the doves, and they have long wings, a large mass of naked skin at the base of the beak, and a circle of naked skin around the eyes. Their



Photo Keystone

ALEXIS CARREL

speed is marvelous, and the distance they can fly without rest seems almost unbelievable. An American homing pigeon is known to have made a journey of 1,040 miles without stopping. It is thought that the pigeon was first used as a carrier by the Chinese, but the date is unknown.

Carrier pigeons are trained for service in war. During the World War (which see) they carried thousands of messages, flying at a height of about one-half mile. Seldom was one



Photo: U & U

CARRIER PIGEON

A mother pigeon on her nest

killed, owing to swiftness of flight and small size. Messages are placed in small capsules, tied just above the foot. More recently, the National Park Service introduced carrier-pigeon service in connection with the exploitation of the desert region east of the Grand Canyon. In remote regions, pigeons are sometimes carried in tourist automobiles and released when emergencies arise. See PIGEON. D.L.

CARRION FLOWER. See SMILAX.

CARROLL, CHARLES (1737-1832), an American statesman of Revolutionary fame, who gave freely of his wealth to further the patriot cause, and was influential throughout the war and during the early national period. He was born in Annapolis, Md., but received his education abroad. On his return to Maryland, in 1765, he settled on an estate in Carrollton, the name of which appears in all his signatures, for, to distinguish himself from others who had his name, he always signed himself, "Charles Carroll of Carrollton." In 1776 he was elected to the Continental Congress from Maryland, and was one of the signers of the Declaration of Independence (which see); it is an interesting fact in connection with

this that he outlived all of the other signers. In 1776 the Continental Congress sent him, with Samuel Chase and Benjamin Franklin, on a fruitless mission to Canada in the hope of persuading the Canadians to join cause with the Americans. In 1789 he was elected as the first Senator from Maryland under the Constitution of the United States, and served until 1792. Carroll's last public act was performed on July 4, 1828, when he turned the first spadeful of earth in the building of the Baltimore & Ohio Railroad—the first passenger railway in the United States.

CARROLL, LEWIS. See DODGSON, CHARLES.

CARRON, kair' on, OIL. See BURNS AND SCALDS.

CARROT, kair' ut, a familiar garden and field vegetable of the parsley family, cultivated for its root, which is both a table and a stock food. The plant is a biennial; that is, its entire period of growth extends through two seasons (see BIENNIALS). The roots are yellow, white, or reddish, and are slender and tapering, those raised for table use being smaller and finer-grained than the stock varieties. Carrots are grown from the seed. Those for the table may be sown in the spring as soon as the weather is settled; the rows should be from one to two feet apart, and the growing plants kept from two to three inches apart in the row.



EDIBLE ROOT OF THE CARROT PLANT

They thrive best in a rich soil containing sand and clay. The beds should be kept free of weeds throughout the growing season.

Carrots for stock are planted in April or May and grow well into the fall before maturing. The roots are an excellent food for farm animals, especially for dairy cattle, as they make a good quality of milk for butter. For

the table, carrots are cooked in cream, boiled, and seasoned in various ways, used in soups, etc. They are relatively rich in sugar, containing about nine per cent of this carbohydrate, and are an especially good food for young children because of a high iron content. Carrots also contain three types of vitamin, A, B, and C (see VITAMINS). In preparing the vegetable for the table, one can lessen the loss of sugar resulting from boiling by cooking the whole root, or large pieces of it, very quickly. Like many other garden vegetables, carrots may be stored through the winter. If dried thoroughly and packed in a box between layers of sand or moss, they will keep for months.



THE CARROT PLANT
Showing plant stalk, leaves,
flowers, and seed

In Germany, the carrot, cut into small pieces and thoroughly dried, is used as a substitute for coffee, and in the United States it has been used to adulterate coffee. The plant contains a coloring matter, carotin, that is sometimes used to color butter. The wild carrot is a troublesome weed with a woody root.

B.M.D.

Scientific Name. The scientific name of the parsley family, to which carrots belong, is *Umbelliferae*. The botanical name of the garden carrot is *Daucus carota*.

CARSON, CHRISTOPHER (1809-1868), a famous American frontiersman, better known as KIT CARSON. Probably no romantic hero of fiction has aroused more interest in lovers of adventure than has this cool-headed, daring trapper and hunter. In American history of the regions beyond the Mississippi, he occupies a place similar to that held by Daniel Boone east of the Alleghanies. Indeed, he was a relative of Boone; both were born in Kentucky - Carson on December 24, 1809. He went to Missouri early in life, where for a time he was apprenticed to a saddler. In 1826 he began his adventurous life by accompanying a party of hunters to New Mexico. Later he went several times to the Pacific coast and acted as hunter for Western army garrisons. He was with Fremont in two expeditions across the Rocky Mountains; Fremont said of him, "With me, Carson and truth mean the same thing."

Appointed United States agent to the Utah and Apache Indians in 1854, he performed notable service for the government through his friendship with influential chiefs; and during the War of Secession, as a scout in the Southwest, he acted with great energy and skill in behalf of the Union. At the close of the war, he was brevetted brigadier general. Many of his thrilling adventures as scout, guide, hunter, trapper, and Indian fighter were almost incredible; and in cunning and resourcefulness, as well as in woodcraft, he rivaled, if he did not excel, the most expert Indians.

CARSON, SIR EDWARD (1854-), a British statesman, noted for his violent opposition to Home Rule for Ireland. He was born in Dublin, was graduated from Trinity College there, and in 1892 was elected to the British Parliament as member for Dublin University, at the same time becoming Solicitor-General for Ireland. Thereafter he was a conspicuous figure in all the debates on questions relating to Ireland. His opposition to the Irish Nationalists, led by John Redmond, naturally allied him with the Conservatives, or Unionists, and he was Solicitor-General in the Salisbury and Balfour Conservative Ministries from 1900 to 1906. In Parliament he was recognized as a brilliant debater, absolutely fearless but inclined to extremes, and because of the latter defect did not reach leadership in his party.



Photo Brown Bros
SIR EDWARD CARSON

In 1912 Carson was the leader of the Ulstermen in their resistance to Home Rule. The introduction of a new bill to establish Home Rule in Ireland was followed by threats of revolution in Ulster, whose Protestant Orangemen declined to be ruled, so they said, by the Roman Catholics. Even before the bill was presented to Parliament, Carson organized a mass meeting of nearly 100,000 armed men, who paraded before him and Prime Minister Bonar Law, as a warning to the government. In the House of Commons, Carson was bitter in his denunciation of the bill, and in Ireland he became "general" of the Ulster volunteers.

Their violent opposition led to a proposal of compromise, but before any agreement could be reached, the outbreak of the World War in 1914 indefinitely postponed a decision. When the Asquith Ministry was reorganized, in May, 1915, Carson was appointed Attorney-General. When the Irish Free State was formed, Carson headed the Belfast government, which reso-

lutely refused to join the Free State. During all the negotiations he was spokesman for the North. See IRELAND; HOME RULE.

CARSON CITY, NEV. See NEVADA (back of map).

CARTAGENA, *kahr to je' nah*, COLOMBIA. See COLOMBIA (The Cities).

CARTE BLANCHE, *kahr' blahNsh*, a French term meaning *white paper*, is a blank paper signed by one in authority and entrusted to another to fill in as he pleases. Thus, in 1649, the Prince of Wales (later Charles II) tried to save his father's life by sending a *carte blanche* from The Hague to the English Parliament to be filled up with any terms which that body would accept as the price of safety for the doomed regent. The term is now used to mean, in substance, "Do as you please."

CARTER, HOWARD. See EGYPT (Late Excavations); TUTANKHAMEN.

CARTER, MRS. LESLIE (1862-), one of the leading actresses on the American stage, who rose to fame through her ability to portray powerful emotion. She made her first appearance as an actress in 1890 in David Belasco's *Ugly Duckling*, at the Broadway Theater, New York. Though she showed promise, her performance in the play was not remarkable, and after a season in *Miss Helyett*, a musical comedy, she retired from the stage for a period of study. For eighteen months she was trained and coached by Belasco, appearing at the end of that time, October, 1895, as Maryland Calvert in *The Heart of Maryland*. Her success in this play was immediate and extraordinary, and she repeated her triumph three years later in London.

Mrs. Carter was equally successful in *Du Barry*, by Belasco and John Luther Long, a play that she used for three years, and in *Zaza*, Belasco's English version of a French drama. In 1906 she severed her connection with Belasco and became her own manager. Before her retirement she co-starred with John Drew in *The Circle*.

CARTER DOME. See NEW HAMPSHIRE (The Land).

CARTERET, *kahr' tur et*, SIR GEORGE. See NEW JERSEY (History: Settlement).

CARTHAGE, *kahr' thayj*, one of the most celebrated cities of ancient times, in the third century before Christ the great commercial rival of Rome. It was situated in North

Africa, three miles from the site of modern Tunis, on a peninsula extending into a small bay of the Mediterranean Sea.

Carthage is famed in legend and in history, and two stories are told of its origin. In classic myths, it was founded by Dido, daughter of a Phoenician king of Tyre, and under her kindly rule became a rich and flourishing city. How Aeneas and his company of Trojan exiles were driven by storms to seek her hospitality, how the Carthaginian queen entertained the hero for many months, and on his departure threw herself in grief and despair upon the blazing funeral pile—all is vividly told in Vergil's story of the wanderings of Aeneas.

The historical account of the city's founding is that merchants from the neighboring colony of Utica and from the mother city of Tyre, in Phoenicia, established a trading post on the site about 850 B.C., and called it Karthadshat, or "New City." Because of its splendid location on the Mediterranean shore, Carthage became one of the greatest commercial centers of antiquity, and its people early began to extend their dominions by colonization and by conquest. In the third century B.C., when it was at the height of its power, Carthage was a magnificent city of about 700,000 people, holding sway over the northern coast of Africa from the modern Gulf of Sidra to the Strait of Gibraltar, and over Sardinia and nearly all of Sicily, while tribute was collected from Southern Spain and Corsica. All of the coasts and islands of the Mediterranean were visited by Carthaginian merchantmen, and these hardy traders even ventured to the Azores, Britain, and the Baltic Sea.

Historians and excavators have learned many interesting facts about the great city, whose site is now marked by two or three small hamlets and numerous ruins. Across the peninsula on which the city was built was a triple wall of towers. The sides were likewise defended by walls, and two harbors, connected by a canal, served for the navy and for merchant vessels. The military harbor was circular in shape and provided with docks sixteen feet in width, which were large enough to hold 220 vessels of that period. Less than a mile north of the harbors rose the hill of Byrsa, the citadel of the city. Excavators have unearthed the ruins of the ancient walls and of public buildings and tombs.

Nothing is known of Carthaginian history before the sixth century B.C. The first wars of importance were fought with the Greeks, in the fifth century, over the control of Sicily, which was abandoned by the Greeks in 275 B.C. The conquest of the southern part of Italy by the Romans brought Rome and Carthage into close contact, and as the Romans viewed the commercial supremacy of the Car-



Photo Brown Bros

MRS. LESLIE CARTER



(Note: Visual Education Service)

PRESENT-DAY VIEW OF THE SITE OF ANCIENT CARTHAGE

thaginians as a grave menace to their own rising glory, war followed inevitably. The first conflict began in 264 B.C. Two other wars were fought, and in 146 B.C. Carthage was captured and destroyed after a desperate siege of two years. The burning of the city continued more than two weeks.

The northern coast of Africa became a Roman province, and Carthage, rebuilt by the Emperor Augustus in 29 B.C., was accounted one of the finest cities in the Roman Empire



LOCATION MAP

in the second and third centuries of the Christian Era. The Vandal king, Genseric, made it his capital in 439, and nearly a century later it was wrested from the Vandals by Belisarius, the great general of the Emperor Justinian. In 647 Carthage was destroyed by the Arabs, and was never rebuilt.

Related Subjects. The reader is referred in these volumes to the following articles:

Aeneid	Genseric
Cato (the Elder)	Phoenicia
Dido	Punic Wars
Rome (History)	

CARTHAGE, Mo. See MISSOURI (back of map).

CARTHUSIANS, *kahr thu' zhanz*, an order of monks which takes its name from the solitary village of Chartreuse, in the French Alps, where in the eleventh century Saint Bruno of Cologne, with six companions, established the first Carthusian monastery. These hermit monks wore rude garments, ate vegetables and coarse bread, slept on beds of straw, and were rigid in their observance of fasting, seasons of prayer, and night-watching. The modern Carthusians live with almost the same austerity. The members of the order were from the beginning well educated and given to hospitality and charity. At one time they had the finest convents in the world, of which La Grande Chartreuse, in France, and the Certosa di Pavia, south of Milan, are among the most celebrated. At the present time, there are fewer than twenty Carthusian monasteries on the European continent.

In England, the name *Charterhouse* was applied to the Carthusian monasteries. The most famous of these, established in London in the fourteenth century, became in the course of time an almshouse for old men and a free grammar school for poor boys. Thackeray attended this school in his boyhood, and made it the background for scenes in *The Newcomes*.

[Chartreuse, a strong liquor made in three colors, originated with the Carthusian monks of La Grande Chartreuse.] G.W.M.

CARTIER, *kahr tyä'*, JACQUES (1494?-1557?), a bold and daring navigator whose explorations in America under the flag of France gave that country the basis for its claim to the great domain of Canada. In the year 1534, Cartier was commissioned by Francis I to head an expedition to North America for the purpose of adding new lands to the French dominions.

and to discover a passage to China (see NORTH-WEST PASSAGE). In early summer, the little fleet of two small vessels reached the coast of Newfoundland and passed through the Strait of Belle Isle into the Gulf of Saint Lawrence. After sailing along the shores of New Brunswick, Cartier made a landing at Cape Gaspé, on the eastern coast of the present province of Quebec, and took formal possession of the country in the name of Francis I. The following May he made a second trip to the New World; on this voyage he discovered the Saint Lawrence River, giving it the name of the saint on whose feast day he first sighted its waters. He journeyed up the river to a small Indian village over which towered a great hill called by him Mount Royal, the present site of Montreal. On a third visit, in 1541, he built a fort near the site of Quebec. See CANADA (History); QUEBEC (city).



Photo Brown Bros

JACQUES CARTIER

CARTILAGE, *kahr' ti layj*, or **GRISTLE**. If you look at the end of the breastbone of a chicken, you will notice that it is not bone at all, but a white, elastic substance that can easily be bent in any direction. Further observation will show that this substance gradually changes into bone, and that it is difficult to tell just where the bone begins. This white elastic substance is cartilage, or gristle. Cartilage is found in the body of every animal that has a backbone. It is of two kinds, temporary and permanent. Temporary cartilage is gradually replaced by bone before the skeleton is mature. The tip of the breastbone of a fowl over a year old, for example, is hard bone; in the chicken it was cartilage. There is also more cartilage in the skeleton of a child than in that of an adult; in the latter, most of the temporary cartilage has been changed to bone. Permanent cartilage is represented by that found around the joints, and does not change to bone. The external ear is made of this kind of cartilage and it also occurs in the nose and the eyelids. It is white, tough, and flexible, serving as a padding between the harder bones, and is useful in holding the bones in position at the joints and enabling the joints to bend. See BONE; JOINTS.

K.A.E.

CARTOGRAPHY. See GEOGRAPHY.

CARTOON. As most commonly used today, the word *cartoon* refers to a humorous or satiric picture intended to hold up to ridi-

cule some public man, party, or movement. Practically all of the great daily papers, as well as many magazines, have such sketches, and they play a large part in recording history. In this sense, the word means practically what caricature meant earlier, and a brief history of the art of caricature, or cartoon-making, is given under that title. Cartoons in recent years have undergone a decided change of spirit from the old venomous, biting style to a type that is merely humorous or entertaining, with but a mild touch of satire.

The technique, the elimination of all unnecessary lines, the selection of the essential characteristics, the certain emphasis, the appeal to the sense of the humorous by just the right line—all these enlist our keenest interest, study, and criticism of the artist's product. But the intelligence, the knowledge of history, the understanding of present conditions in government, and the appreciation of individual characteristics that must be back of the pencil prove that the successful cartoonist must be a student as well as an artist, with imagination and with charity. The power of a cartoonist of ability can scarcely be overestimated, and his responsibility is also great.

As the article **CARICATURE** relates, Leonardo da Vinci made caricatures, but he also made cartoons. In those days, the two were entirely different, for originally a cartoon was a drawing made on heavy paper and used as a model for a large picture in fresco, tapestry, or oil. It was made exactly the size of the picture intended, and the design was transferred to the canvas or wall by means of tracing or pin-pricking. The process was much like that by which school children produce maps, for carbon was smeared on the back of the drawing. Some of the old cartoons or designs of the master painters have a real value of their own, aside from that of the finished painting. Most famous of those that have survived are seven cartoons of Raphael for the Vatican tapestries, which are preserved in the South Kensington Museum in London. Modern painters seldom use the cartoon method. See illustration, page 1222.

Related Subjects. Of the famous cartoonists or caricaturists, the following are treated in these volumes.

Bairnsfather, Bruce	Gibson, Charles Dana
Briggs, Clare A	Hogarth, William
Cruikshank, George	McCutcheon, John T
Darling, Jay Norwood	Nast, Thomas
Du Maurier, George	Opfer, Frederick B
Fisher, Harry Conway	Outcault, Richard F
	Tenniel, John

CARTOUCHE, *kahr' toosh'*, a word applied to various oval ornaments, scrolls, or shields used in heraldry and art. A special use of the term occurs in Egyptian archaeology, the *cartouche* being an oblong frame with oval ends, which enclosed the names of kings and queens engraved on monuments. The scroll-shaped



Types of Cartoons. Above, a French idea of the use of the televox (see TELEVOX). An early English cartoon based on the election of beadle. A Japanese drawing portraying phases of life in Nippon.

volute of the capital crowning the shaft of an Ionian column (see COLUMN) is an example of the use of the cartouche in architecture. In heraldry the term denotes an oval shield with a convex surface, on which were borne the arms of the Pope and Church officials of noble birth.

The modern use of the word is borrowed from the Italian *cartoccio*, meaning *roll of paper*. Originally, a cartouche was a roll of parchment, paper, or other material which held the charge of powder and shot of a firearm, that is, a cartridge. The word *cartridge* is itself a corruption of *cartouche*.

CARTRIDGE, *kahr'trij*, the name of a case of paper or metal holding a charge of explosive powder and a bullet or a number of pellets, to be fired from firearms. The cartridge used in modern rifles and machine guns is a cylinder made of brass and contains a percussion cap at the base. The explosive is inserted in the cylinder and the bullet is placed on top of it, the brass being crimped or pressed against the bullet to hold it firmly in place. Cartridges for shotguns are usually made of stout paper in several thicknesses, with a brass base to give additional strength and hold the percussion cap. A *blank cartridge* is a cartridge with a charge of explosive, but without ball or shot. See AMMUNITION; PROJECTILE; CARTOUCHE.

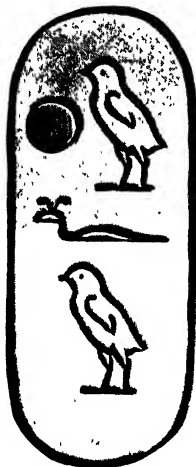
CARTWRIGHT, EDMUND (1743-1823), the English inventor whose crude machine for cotton-weaving, constructed in 1785, laid the foundation for the magnificent power looms of the present day. He was born in Nottinghamshire, educated at Oxford, and became a clergyman of the Church of England. When past forty years of age he began to take an interest in machinery, an interest destined to make him one of the chief promoters of the prosperity of the English people. Misguided workmen, who thought that machinery would take away their only means of earning a living, burned down the

mill in which four hundred of his looms were set up, but Cartwright was not discouraged. He invented a wool-carding machine, a device for making ropes, and a steam engine in which alcohol was used as fuel, besides helping Robert Fulton in his experiments on steamboats. Having spent his own income in bringing out his inventions, which yielded him little in return, Cartwright was granted \$50,000 by Parliament in 1800. See LOOM; WEAVING.

CARTWRIGHT, PETER (1785-1872), a Methodist circuit-rider, or itinerant preacher, one of the most influential and most picturesque figures of the pioneer days of Illinois. He was born in Amherst County, Virginia, and when five years old was taken by his family to Logan County, Kentucky. Peter grew up a wild and reckless boy, given to gambling and other dissipations, but he was converted at about the age of sixteen, and shortly afterward became a local preacher. In 1803 he was accepted into the regular ministry, and three years later Bishop Asbury, the first Methodist bishop in America, ordained him an elder.

In 1824 Cartwright settled in Sangamon County, Illinois, then a struggling pioneer region inhabited by a few resolute and enterprising settlers. The spirit of the man made itself felt in the life and development of that community for half a century, and it has been truthfully said of him that he had as much to do with the upbuilding of Central Illinois as any other man of his time. Not only was he a powerful and tireless preacher, but he interested himself in the spread of education and in the political affairs of the state. When the capital was at Vandalia, Cartwright was a Democratic member of the state legislature, and at one time was Abraham Lincoln's unsuccessful opponent in a campaign for election to Congress.

Many tales have come down about his eccentric habits, his gifts for story-telling and his fearlessness in dealing with the unruly members of the community. In some cases, it is said, he found the "arm of the flesh" a better weapon than moral suasion. His life was a powerful influence for righteousness, and his memory is still revered. He lies buried in the village of Pleasant Plains, Sangamon County, the scene of some of his labors.



CARTOUCHE

The name of Khufu (Cheops)



Photo. Visual Education Service
PETER CARTWRIGHT



Photo. Brown Bros

EDMUND CARTWRIGHT

[Among several well-known writings are his pamphlets entitled *Controversy with the Devil* and *The Autobiography of the Rev. Peter Cartwright*.]

CARUSO, *ka roo' zo*, ENRICO (1873-1921). This Italian operatic tenor enjoyed uninterrupted popularity throughout his career. He was born in Naples, where he began singing in churches at the age of eleven. Ten years later he sang his first part in opera, and in 1896, as Alfredo in *La Traviata*, attracted much favorable notice. Through four seasons he sang the leading tenor rôles at the municipal opera house of Milan, where he took the part of Jean in the first Italian performance of Massenet's *Sapho*. His appearances in the leading cities of Russia and Germany, in Buenos Aires, London, Rome, and Lisbon were highly successful, and his triumphs were repeated in 1904, when he began his first American season at the Metropolitan Opera House in New York.

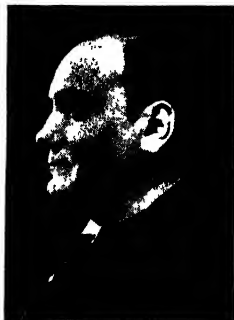


Photo: Brown Bros.

ENRICO CARUSO

Caruso's extraordinary success was due to the very unusual power, sweetness, and range of his voice, which critics always described as "golden." He always was able to attract immense audiences, which accounts for the enormous sums paid for his services. He made a contract with the New York Metropolitan Company by which his salary was nearly \$200,000 a year for four years. He was paid about \$40,000 a year for singing for phonographs, and the "records" thus made have brought prices ranging as high as \$7 each.

[Caruso's most successful rôles were Rhadamès in *Aida*, Manrico in *Il Trovatore*, Turiddu in *Cavalleria Rusticana*, and Johnson in *The Girl of the Golden West*.]

CARVER, JOHN (1575-1621), a leader of the Pilgrim Fathers, chosen during the *Mayflower* voyage to be first governor of Plymouth Colony. He was born in England, and because of the severe religious persecutions, went to Leyden, in Holland, then a refuge for the Puritans. He was an elder in the church and one of those who secured the original patent for the new colony in America. His election to the governorship was unanimous, and he justified the choice of the colonists by his firmness, prudence, and ever-ready courage. Four months after the arrival in Massachusetts, however, he died from the effects of a sun-stroke. See **PILGRIMS**; **PURITANS**; **MAYFLOWER** (The Honored 102).

CARVING, according to the most general use of the term, is the art of fashioning ornamental or natural-appearing figures in ivory and wood. Work in stone or marble usually comes under the head of sculpture, but the term carving is properly applied to the smaller figures cut in stone or marble, such as leafage, scroll work, statuettes, etc. The oldest known examples of wood carving are Egyptian. This beautiful art came into extensive use early in the Christian Era, and was long popular in the decoration of the churches of Central Europe, especially in Germany, where the shrines and alters were sometimes adorned with whole scenes from the lives of the saints. Among the Swiss peasants, wood carving is a regularly organized occupation.

Wood is admirably adapted to the representation of those forms which have life and movement, and a good piece of wood carving has a freshness and vigor that carved ivory, stone, or marble does not possess. The art is one that boys and girls can learn without great difficulty, and it is being offered now as a course of study in many art and manual-training schools.

That ivory carving was practiced among the ancients is known from the specimens found in Egyptian tombs and in the ruins of Nineveh; ivory was also used by the Greeks and Romans for various ornamental purposes. Among the most interesting specimens of the early period are the wax writing tablets used by the Roman consuls, the outsides of which were made of ivory ornamented with beautifully carved figures. Ivory was used extensively in the Middle Ages in the ornamentation of the churches and for other purposes. Coffins were often covered with carved ivory plates, and among the gifts received by Charlemagne were two richly carved doors. Ivory adapts itself readily to the carver's art because of its elasticity and evenness of texture, and at the present time it is used quite generally for toilet articles, ornaments of various kinds, chessmen, knife handles, and other objects.

Related Subjects. The reader is referred in these volumes to the following articles

Ivory Sculpture Wood Carving

CARY, ALICE (1820-1871) and PHOEBE (1824-1871), two American poets, sisters and life-long companions, whose graceful and picturesque verses were greatly admired in their own day, and are still read and enjoyed. They were born and brought up on a farm in the valley of the Miami, in Ohio. Their only education was that afforded by the country school in the district, and for years they depended for reading matter on their home library—a shelf of half a dozen books. Though their educational advantages were so limited, the sisters constantly studied and wrote, holding

fast to the idea that some day all people would read their poems.

When Phoebe was fourteen and Alice eighteen, they began to see their names in print, and in the course of the next few years they became widely known as writers of charming little poems that found wide circulation.



Photo Brown Bros

ALICE CARY

In 1849, Horace Greeley visited them in their home, they determined to try their fortunes in New York. In 1851 they settled in the city, and there lived and wrote together for the next twenty years, mingling with a brilliant group that included Horace Greeley, Bayard Taylor, Richard and Elizabeth Stoddard, Justin McCarthy, and Thomas Bailey Aldrich.

There is great similarity in their choice of subjects, though they show differences in poetic temperament. The poetry of each may be divided into groups, as ballads and narrative poems, religious poems and hymns, poems of nature and of sentiment, and poems for children. Alice was more delicately imaginative than her sister, but less dramatic, and Phoebe possessed more wit. In their nature poems, Alice saw the soul in nature, and loved to interpret its moods, while Phoebe associated nature with human experiences. They loved children equally well, but Alice showed in her poems more of the motherly affection for them; Phoebe regarded them as comrades.

One of Alice's finest achievements is her *Pictures of Memory*, beginning—

Among the beautiful pictures
That hang on Memory's wall
Is one of a dim old forest,
That seemeth best of all.

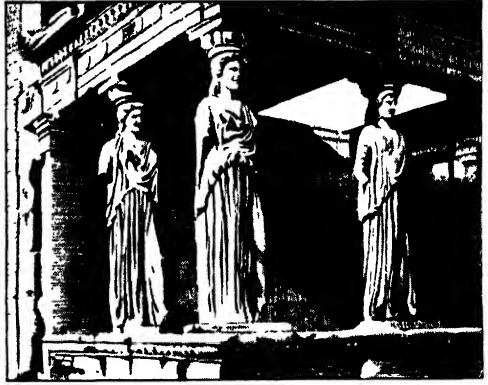
Edgar Allan Poe said of this poem that in rhythm it was one of the most perfect lyrics in the English language. Of all of Phoebe Cary's poems, none made a wider appeal than the hymn *Nearer Home*, which begins—

One sweetly solemn thought
Comes to me o'er and o'er—
I am nearer home to-day
Than I ever have been before;

Nearer my Father's house,
Where the many mansions be;
Nearer the great white throne,
Nearer the crystal sea.

B. M. W.

CARYATIDES, *kair i at' ih deez*, OR **CARYATIDS**, the name applied in Greek architecture to female figures dressed in long robes, when used as columns to support a roof. The most celebrated of these figures appear on the southwest porch of the Erechtheum (which



CARYATIDES

In the porch of the Erechtheum.

see), a temple on the Acropolis of Athens. The corresponding male figures are called *Atlantes*. The name is the plural of the Greek *Caryatis*, meaning a woman of *Caryae* (in Laconia). In this city there was a temple to the goddess Artemis, and during her annual festivals there, virgins were accustomed to dance in her honor. Some authorities say that these dancing maidens suggested to architects the idea of using their images as columns. See SCULPTURE.

CASABA. See **CASABANCA**

CASABIANCA, *kah zah byahng' kah*, the boy who "stood on the burning deck, whence all but him had fled." Mrs. Hemans' famous poem, which begins with the lines quoted, tells how he remained steadfast until the vessel was destroyed by an explosion, rather than leave without his father's express command. And the father, meanwhile, lay too deeply wounded to hear his son's cry.

Casabianca was a real boy, only ten years old at the time he met his death. The father was captain of the *Orient*, the flagship of Napoleon's fleet, and during the Battle of Abukir Bay in 1798 was compelled to assume command of the whole fleet because the admiral had been killed. The death of the brave boy roused much sympathy and admiration, and Mrs. Hemans expressed the general feeling in the closing words of her poem:

But the noblest thing that perished there
Was that young faithful heart.

The poem has often been parodied, and thus has been deprived of some of its appeal, but the boy's deed itself has never lost its power to thrill. The name Casabianca has, in fact, become a symbol of child heroism.

CASABLANCA, *kah sah blang' kah*, a Moroccan seaport. See MOROCCO (The Cities).

CASA GRANDE, *kah' sah grahn' da*. See MONUMENTS, NATIONAL.

CASCADE. See WATERFALL.

CASCADE RANGE, a mountain chain in the western part of North America, extending from Northern California through Oregon and Washington to British Columbia and Alaska. It is usually called a northward continuation of the Sierra Nevada, from which it is separated by a series of deep valleys near Mount Shasta. This peak, rising 14,380 feet above the sea, is the loftiest in the range and is one of the most magnificent mountains in North America. Mount Rainier, or Tacoma, whose summit is 14,408 feet above the sea, Mount Adams, 12,470 feet, and Mount Hood, 11,225 feet, are other beautiful peaks. Many of the peaks of the range are extinct volcanoes. See RAINIER; HOOD.

As a mass, the Cascade Range is comparatively low and broad, though rugged in outline and topped by snow-clad peaks. Especially in Oregon and Washington, where the Columbia and the Klamath rivers have cut deep canyons through the mountains, the scenery is magnificent. The slopes, particularly on the west, are heavily wooded and seem to form a great dark cloak for bright green pastures, shimmering blue lakes, and glistening white peaks. The Cascade Range is the home of the Douglas fir, a tree which often reaches a height of 200 feet or more and is justly considered one of the most beautiful trees in the world. Practically the whole of the mountain forest area in Oregon and Washington is now included in national forest reserves. See OREGON (The Land).

The Cascade Range is generally considered to end at the international boundary. Its natural continuation in British Columbia would be the nearest mountains to the Pacific, which are called the Coast Range. This is comparatively low, seldom reaching above 8,000 feet, but is snowy and contains numerous glaciers. It is cut into deeply by splendid fiords, and the larger rivers, such as the Fraser, the Skeena, and the Stikine, have cut profound and picturesque canyons and valleys through the range. The Canadian Pacific Railway follows the Fraser canyon to the sea, while the Grand Trunk Pacific uses the Skeena Valley, 500 miles to the northwest.

Old Cascade Tunnel. The Great Northern Railway has cut a tunnel under the crest of this range at a point about fifty miles southeast of Everett and fifty-five miles east of Seattle. The tunnel is sixteen feet wide, twenty-one and a half feet high and 13,416 feet, or 2.6 miles, long. This is one of the most noted engineering works of its kind on the North American continent. A similar tunnel on the Northern

Pacific Railway, about fifty miles directly southeast of Seattle, is 9,850 feet long.

New Cascade Mountains Tunnel. The tunnel recently completed through the Cascade Mountains in Washington is the longest in the western hemisphere and the fourth largest in the world. This great engineering project was undertaken by the Great Northern Railway, and on completion, it opened a new era in transportation in the Pacific Northwest. It is 7.79 miles long, and is cut on a tangent across the Cascades from Scenic, on the west, and Berne, on the east. The Great Northern Railway undertook the work in order to eliminate the heavy annual expense of hauling traffic over the mountains, to speed up its service, and to afford a permanent protection from snow slides. Actual work of boring the tunnel was started early in 1926. It was ready for use late in 1928.

CASCADE TUNNEL. See top of column.

CASCARA SAGRADA, *kas kah' rah sah-grah' dah*, a shrub or small tree of the buckthorn family, the dried bark of which is widely used in the preparation of laxatives for chronic constipation. The plant is found in Pacific coast regions between Mexico and British Columbia, and east to Montana and Texas. A substance called *purshianin* gives the bark its medicinal value.

After being stripped from the branches, the bark is dried and packed tightly, and is usually kept for a year before being used. The preparations made from it appear in the form of pills, tablets, and liquids, many of them being patent medicines. Cascara sagrada acts chiefly on the colon, and is superior to many other laxatives because the dose can often be reduced instead of increased.

Classification. The botanical name of the cascara sagrada tree is *Rhamnus purshiana*.

CASE, a term which denotes the relation of a noun or a pronoun to the other words in the sentence. In Latin, case is always indicated by *inflecting*, or changing, the ending of words, but in English, most case-endings have been dropped, and case is commonly indicated



CASCARA
(a) Male flower; (b) female flower; (c) fruit.

by the *order* in which the words are used; that is, the place which the word occupies in the sentence. To illustrate: In the sentence, "Arthur gave Ernest Mary's ball," all except one of the words are nouns, each used in a different way. *Arthur* is used as the subject of the sentence, *ball* is the direct object of the verb *gave*, *Ernest* is the indirect object, and *Mary's* is used to modify *ball* and indicates ownership. If such a sentence were written in Latin, each of these different uses would be indicated by changing the endings of the words themselves. In Old English, too, nouns were inflected to show their case, but in modern English they are inflected only in one case, the possessive.

Order Determines Case. But, although the inflected forms of nouns have disappeared, the names of the different cases have been retained; these are used, in sentence analysis, to indicate the relationship of nouns to other words. For example, the only way in which the noun *Arthur* is inflected is by adding *'s* to form the possessive. Taking the sentence used above, let us see how changing the position of the various words will alter their case and therefore the meaning of the sentence. For example, in the sentence, "Arthur gave Ernest Mary's ball," *Arthur* is the subject of the sentence, therefore is said to be in the *nominative* case. If the sentence is changed to read, "Ernest gave Arthur Mary's ball," *Arthur*, simply through its changed position, becomes the indirect object of the verb and is then said to be in the *objective*, or *accusative*, case. Or, the sentence might read, "Ernest gave away Arthur's ball," in which event *Arthur's* would be in the *possessive*, or *genitive*, case.

There are, in English, three cases: the *nominative*, the *possessive* (or *genitive*), and the *objective* (or *accusative*); the *dative* case, pertaining to indirect objects usually preceded by the prepositions *to* or *for*, is sometimes given as a fourth case.

Uses of the Nominative. A noun is said to be in the nominative case when it is used as the *subject of a verb*, as, "*Miriam* called at the house one evening in midsummer"; when it is used as the *predicate complement of a verb*, as, "*Edison* is a great *inventor*"; when it is used in *apposition* with another nominative word, as, "That is *Peary*, the famous *explorer*"; when it is used as the *person or thing addressed*, as, "*Agatha*, where have you been?" or when it is used independently as the subject of a participial clause, in what is called the *nominative absolute*, as, "The *moon* having risen, we started."

Uses of the Objective. A noun is said to be in the objective case when it is used as the direct or indirect object of a verb, two uses which can be illustrated in the same sentence: "Max threw *Peter* the ball." *Ball* is the object

of the verb *threw*; *Peter* is the indirect object, in reality the object of the preposition *to*, understood. Both are said to be in the objective case. A noun is also in the objective case when it is the object of a preposition, as, "Max threw the ball against the *wall*." Here *wall* is the object of the preposition *against*. The objective case of nouns and pronouns is used after *like*, *unlike*, and *near*, which are really adjectives or adverbs but are often regarded as prepositions in this construction; for example, "They ran *like deer*."

The subject of an infinitive must also be in the objective case. In Latin, the infinitive construction is used very freely, and the subject of the infinitive is always in the accusative case, which corresponds to the English objective case. In English, the infinitive construction with the subject expressed is possible only in conjunction with a transitive verb. In the sentence, "I believed him to be honest," *him* is the subject of the infinitive *to be honest*, and the entire phrase is the object of the verb *believed*. Where the infinitive *to be* takes a complement, the case of that complement must be objective, to agree with the case of the infinitive's subject, as in the sentence, "They thought *me* to be *him*."

A noun or a pronoun in apposition with another noun or pronoun in the objective case is also put in the objective; as, "I have engaged Johnson, the *carpenter*"; "I have engaged Johnson, *him* whom you recommended."

Forming the Possessive, or Genitive. A noun is said to be in this case when it denotes ownership; as, *Paul's* umbrella; *Stanley's* skates. Possession may also be indicated by means of a prepositional phrase, as, the banks *of the river*.

Singular Possessives. The possessive case is formed in the singular by adding to the nominative form of the noun the letter *s*, preceded by an apostrophe ('). In old English the possessive was formed by adding *es* to the noun, as in Chaucer's phrase, "lordes werre" (lord's war). As this gave many possessives the same form as the plural, gradually the *e* was dropped and the apostrophe substituted to indicate the omission, so we now write it *lord's*. If a word ending in an *s* sound becomes awkward to pronounce through the addition of another *s*, the apostrophe alone is added; as, *Moses'* law, for *goodness'* sake. In some words, however, the *s* is almost always added; as, *Burns's* poems, the *empress's* command. There is no fixed rule for the formation of such possessives, and the problem is often avoided altogether by using the prepositional phrase with *of* where it does not affect the meaning; as, in the law *of Moses*, the poems *of Burns*. The tendency is to indicate possession by means of the proposition *of* in most cases where the object is without life;

as, the clasp of the necklace, not the necklace's clasp; the cause of the war, not the war's cause.

Plural Possessives. Rules for the formation both of singular and plural possessives are given in the article NOUN.

Compound Possessives. Only the last word in a compound word is inflected, as, *sister-in-law's*. The same rule is followed if joint possession is to be indicated, as, *Thurber and Brown's studio*, *William and Mary's uncle*. But where the possession is not common, the sign of the possessive must be added to each noun; as, *Grant's* and *Lee's* forces; the poem is neither *Bryant's* nor *Whittier's*.

Double Possessive. There is a curious idiomatic double possessive which in some cases seem absolutely necessary to bring out the meaning; for instance, "this picture of my uncle" does not convey at all the same meaning as "this picture of my uncle's." The same is true of expressions like "this introduction of Shaw," or "this introduction of Shaw's."

For a detailed account of the cases and inflections of pronouns, see PRONOUN.

CASE, THEODORE W., inventor of one type of talking moving picture. See MOVING PICTURES.

CASEIN, *ka' se in*, the substance in milk which forms the curd in making cheese (see MILK; CHEESE). Casein alone will not form curd, but needs the action of some acid. In its natural state, it bears a close resemblance to the white of an egg, and like white of egg, it is one of the protein food materials, all of which contain nitrogen, carbon, hydrogen, oxygen, and sulphur. Because the casein in fermented milks, such as koumiss (which see), is in a finely divided condition, and is more easily digested than the curds formed in the stomach of a person drinking ordinary milk, these fermented beverages are often prescribed for people with weak digestion.

For commercial purposes, casein is manufactured from cow's milk, of which it constitutes about three per cent. Its characteristic appearance is that of a dry, white, or slightly brownish powder. It is used in making candy and patent foods, in the manufacture of glue, shoe polish, wall paper, paint, and sizing, and as a basis for plastics in imitation of celluloid, ivory, horn, etc. E.V.M'C.

CASEMENT, SIR ROGER. See WORLD WAR (1916, in the West); TOWER OF LONDON; HOME RULE.

CASE METHOD, in sociology. See SOCIOLOGY (Applied Sociology).

CASE SCHOOL OF APPLIED SCIENCE. See OHIO (Education: Western Reserve University); CLEVELAND, O.

CASE SYSTEM. See LAW.

CASH, standard coin of China. See MONEY (Foreign Monetary Standards).

CASH BOOK. See BOOKKEEPING.

CASHMERE (province), a variant of Kashmir (which see).

CASHMERE GOAT, a variety of goat remarkable for its fine, silky fleece, which is used to make the famous, costly cashmere, or kashmir, shawls. A full-grown goat yields only



THE CASHMERE GOAT

eight ounces of the valuable down, which underlies the long hair. To make a shawl a yard and a half square, the fleece of ten goats is required; it takes about a year to weave one shawl, the work all being done by hand. The finest wool is furnished by the year-old sheep, or merino.

The native homes of the cashmere goats are Tibet and India, but they have been raised in France and Germany. Those which live in the higher altitudes are deep yellow; those lower are yellowish-white, and those still farther down, pure white. The colder the region where the goat pastures, the heavier the fleece. The flesh of the cashmere goat is suitable for food, and when well cared for, the animal gives a rich milk. See GOAT. W.N.H.

CASHMERE SHAWLS. See KASHMIR.

CASH REGISTER, a mechanical device for calculating and registering sales and money received. It is now in almost universal use in retail stores. The first practical cash register was invented in 1870 by James Ritty of Dayton, O., and from that time to the present, that city has been the world's center for the manufacture of such machines. Since the first cash register was patented, great improvements have been made, and the device is now an extremely complicated piece of machinery.

It consists of a metal box with drawers for money and papers, and a mechanism which works somewhat similarly to that of a typewriter. Keys marked with figures, when pressed, operate levers which force into view colored squares with legends showing the amount of a sale, and also cause that amount to be registered on a meter. Each sum registered is mechanically added to the previous registry. The total sum registered may be seen at any time by examining the meter,

which is usually kept locked. Cash registers are made with separate departments for each salesman, and some are made to deliver automatically a receipt for the amount registered. See CALCULATING MACHINES.

F.H.E.

CASIMER THE GREAT. See POLAND (History).

CASINO. See CASSINO.

CASPER, WYO. See WYOMING (back of map).

CASPIAN, kas' pi an, SEA, the largest inland sea in the world, situated between Europe and Asia. Its greatest length is 760 miles, its breadth varies from 100 to 280 miles, and it covers nearly 170,000 square miles, an area larger than that of Illinois, Wisconsin, and Iowa combined. It lies eighty-six feet below the level of the ocean. On three sides it is surrounded by Russian territory, and on the east by Persia. About 850 square miles of its area is occupied by islands. There is no ebb or flow of tides, and its water is less salt than that of the ocean, because of the many rivers that flow into it. The Volga, Ural, Terek, and Kura are the most important of its supply streams, and these form important links in the commercial communications between Europe and Asia. Astrakhan, at the mouth of the Volga, is its most important port. The development of the oil wells in the Baku territory, together with the opening of the Transcaspiian railway, has added considerably to the commercial value of this inland sea. Russia obtains its supply of petroleum by the sea route from Baku. Its fisheries are very important, sturgeon yielding the largest quantities. See ASTRAKHAN; BAKU.

CASQUE, kask. See HORNBILL.

CASS, LEWIS (1782-1866), an American statesman, soldier, and diplomat, a powerful factor in American history from the War of 1812 to the War of Secession. He studied at Phillips Academy, in his native town of Exeter, N. H., completed a law course in Marietta, O., and became prominent in Ohio politics. On the outbreak of the War of 1812, he was made colonel of Ohio volunteers, becoming brigadier general in the regular army after a year of service. In 1813 General Cass was appointed governor of the Territory of Michigan, then a great unsettled area on the western frontier. During his long term in this office, which continued until 1830, he made treaties with the

Indians, built roads, organized townships and counties, and laid the foundations of civilization in the wilderness.

Cass became Jackson's Secretary of War in 1831. He was ambassador to France between 1836 and 1842, resigning in the latter year because of his disapproval of the Webster-Ashburton Treaty. In 1845 the state of Michigan elected him to the Senate of the United States, and he represented the state in that body until 1857, except for a brief period in 1848 while he was campaigning for the Presidency on the Democratic ticket. A letter of his, dated 1847, contains the first definite statement of the doctrine of "squatter sovereignty." During the anti-slavery struggle, he favored Clay's compromise measures, upheld the Fugitive Slave Law, and voted for the Kansas-Nebraska Bill.

Cass was appointed Secretary of State by Buchanan, and resigned in 1860 because of the President's refusal to strengthen the forts at Charleston, S. C. He was one of the statesmen of the "old school," deserving of honor because of his work in building up and Americanizing an important section of his country.

Related Subjects. The reader is referred in these volumes to the following articles:

Compromise of 1850	Michigan (History)
Fugitive Slave Laws	Squatter Sovereignty
Kansas-Nebraska Bill	Webster-Ashburton Treaty

CASSABA, kah sah' bah, OR CASSABA MELON, one of the largest varieties of muskmelons. The cassaba is considered a great delicacy in American fruit markets. It originated in Cassaba, near Smyrna in Asia Minor, and is sometimes known as the *Persian melon*. Its color both inside and out is yellow. The flesh is of excellent quality. The outside, like the rind of other melons, is marked by longitudinal channels, but is smooth, lacking the network characteristic of American muskmelons. See color plate, with article FRUIT; also MUSKMELON. B.M.D.

CASSANDRA, kas san' drah, in classical mythology, the unhappy prophetess of Greek legend who was doomed to utter her prophecies to unbelieving ears. She was the daughter of the Trojan king and queen, Priam and Hecuba, and was loved by Apollo, from whom she received the power to foretell the future. When she would not return his love the angry god decreed that none should believe her words. Again and again she warned her countrymen not to keep the stolen wife of Menelaus, the beautiful Helen, and she vainly begged them not to take the Wooden Horse within the walls of Troy (see TROY). In some of the Grecian myths, she is carried away to Greece by Agamemnon and there murdered by his wife, Clytemnestra. See MYCENAE; PARIS (legend).



Photo Brown Bros

LEWIS CASS

Michigan's greatest statesman in the early period.



CASSAVA

The roots of this plant yield the tapioca of commerce. Above is shown a field under cultivation by native Africans.

In Literature. The unhappy lot of Cassandra is the subject of a fine poem by Schiller, a stanza of which is here given.

And men my prophet wail deride!
The solemn sorrow dies in scorn,
And lonely in the waste I hide
The tortured heart that would forewarn
Amid the happy, unregarded,
Mock'd by their fearful joy, I trod;
Oh, dark to me the lot awarded,
Thou evil Pythian god!

The story in which Cassandra is taken to Greece by Agamemnon is told by Aeschylus in his tragedy, *Agamemnon*.

CASSAREEP, *kas' a reep*. See CASSAVA.

CASSAVA, *kas ah' vah*, a bushy shrub of the spurge family, *Euphorbiaceae*, the starchy roots of which are the source of commercial tapioca (which see). The cassava is a plant of the tropics, and though native to the warm parts of America, has been introduced into Africa and other regions of the Old World. There are two forms of cassava, bitter and sweet. Bitter cassava (*Manihot utilissima*) contains a poisonous juice which when pressed out and boiled becomes a delicious sauce called *cassareep*. The sweet form (*M. aipi*) is cultivated to some extent in Florida, and the starch is used for sizing cotton fabrics. In Brazil the cassava is called *manioc* or *mandioc*; in other parts of South America, *yuca* or *yuca*. G.M.S.

CASSEL, *kahs' el*. See GERMANY (Principal Cities).

CASSIA, *kash' ah*, the name of a genus of pod-bearing plants found in tropical and warm temperate regions. The cassias consist of trees, shrubs, and herbs. *Narrow-leaved cassia*, from Nubia, and *broad-leaved cassia*, from India and

Arabia, are commercially valuable, as their leaves are the source of the cathartic senna. The pods, too, are used, but are not so powerful as the leaves. Some species grow wild in the United States. Among these is the partridge pea, which has injurious effects for livestock grazing on it.

The bark of an entirely different plant of the laurel family is commonly called *cassia bark*. Having the flavor of cinnamon, and being cheaper, it is often substituted for it (see CINNAMON). The cassia of the Bible was probably cassia bark. B.M.D.

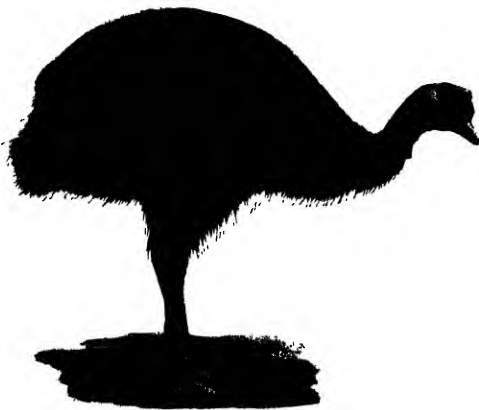
Scientific Names. The true cassias belong to the pulse family, *Leguminosae*. The species producing senna are *Cassia acutifolia* and *C. angustifolia*. A mild sugar laxative is obtained from the pulp of *C. fistula*, found in Africa, the East and West Indies, and tropical America. Cassia bark is obtained from *Cinnamomum cassia*, belonging to the family *Lauraceae*.

CASSINO, *ka se' no*, a game of cards played usually by two persons, though more may play if desired. A full pack of fifty-two ordinary playing cards is used. Four cards are dealt to each player, and four are placed face up on the table. The object of the game is to take as many cards as possible, especially those of scoring value. Each player in turn matches a card in his hand with one on the table. For instance, a player holding a nine may pick up a nine, or two or more cards making up that value, as a five and a four, or a six and a three. If no card can be picked up which will match cards in his hand, the player lays a card face up on the table.

A variation is made by building. Thus, a player may add a four to a three already on the table, provided he has a seven in his own

hand. His opponent may, however, have a seven and may himself pick up the built cards. When each player has played all four of his cards, four more are dealt until all have been played. The last to pick up a trick then claims the remaining cards on the table. Score is taken as follows: for little cassino (two of spades), 1; big cassino (ten of diamonds), 2; each ace, 1; the highest number of cards held by a player, 3; greatest number of spades held by one player, 1. The game is usually twenty-one points.

CASSIOPEIA, *kas-i o pe' yah*, one of the most conspicuous constellations in the northern hemisphere, sometimes called the "Lady in her Chair." It is about the same distance from the North Pole as the Great Bear, and contains a large number of stars; five of the brightest are arranged somewhat in the form of a W (see



AUSTRALIAN CASSOWARY

Photo U & U

are bare and bluish in color, and the head is crowned by a bony crest of brilliant blue, scarlet, and purple. Wattles hang from the neck. The wings are so short that the bird is unable to

fly, but its legs are powerful, and it can run with nearly the speed of a horse. Disliking the sunshine, this timid bird builds its rough nest of leaves and grass in dense, wooded places, and comes out in the morning and evening for its meal of fallen fruit, bulbs, or insects. The plumage of the cassowary is used by the natives for head-ornaments, mats, and rugs, and the flesh is considered delicious. D.L.

Scientific Name. Cassowaries constitute the family *Casuaridae* and the genus *Casuaris*. The common cassowary is *C. galeatus*.

CAST, a reproduction of a statue or other work of art in a mold. The model to be copied is covered with plaster, so applied that it may be removed in sections. When these sections are carefully put together, they form a mold which is filled with liquid plaster. When the plaster is dry, the mold is removed, uncovering a copy of the original model. Most of the famous statues of the world have been copied in this way, thus furnishing models for museums and schools.

CASTALIA, *kas ta' lih ah*, FOUNTAIN OF SEE PARNASSUS.

CASTE, *kast*, a word from the Portuguese *casta*, meaning *family*, *strain*, *breed*, or *race*. In a general sense it means an hereditary division of society on the basis of occupation, wealth, religion, etc. Specifically, however, it applies to the classes into which the Hindus are divided by religious laws. It is probable that caste was originally grounded on a difference of descent and mode of living, and that the separate castes were originally separate races. The caste system prevails principally in India, but it is known to exist or to have existed in many other regions.

In India there are four castes: the Brahmans, or those highest in authority, usually priests; the military order; the husbandman or trader caste, which is divided into sub-castes, according to occupation; and the servant caste. All those below the fourth are called Pariahs, or outcasts. This system has kept the people of India confined within the castes to which they were born. They can never rise above their caste, but can lose caste by wrongdoing, and



THE CONSTELLATION OF CASSIOPEIA

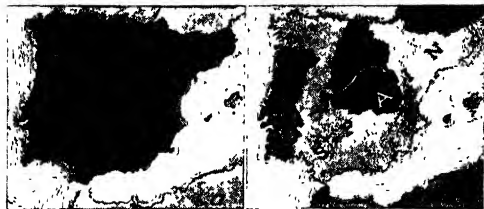
charts, under ASTRONOMY). According to legend, Cassiopeia was the mother of Andromeda, who was chained to a rock on the sea-shore to appease the anger of the gods and was rescued from a monster by Perseus. See ANDROMEDA.

F.B.I.

CASSOWARY, *kus' o wa ric*, a large three-toed bird belonging to the same order as the ostrich and the emu. It is a native of Australia, New Guinea, and neighboring islands. The common cassowary stands about five feet high. Its peculiar hairlike feathers are brownish-black in both sexes. The head and neck

to regain it must perform certain religious rites. The recent development of India's mineral resources and manufacturing facilities has revolutionized the country industrially; now men of high caste work beside those of low caste, but the ancient social distinctions are maintained unchanged outside of working hours. See INDIA (The People).

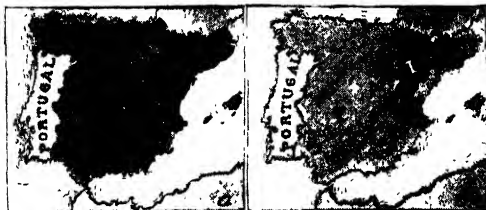
CASTILE, *kas teel'*, **AND ARAGON**, *air' a-gon*, or *ah' rah gohn*, formerly two separate and powerful kingdoms of Spain, which were united in 1469 by the marriage of Ferdinand of Aragon and Isabella of Castile, the monarchs who later earned a place in American history through Columbus. The combined territories



CASTILE (IN BLACK)

(a) Old Castile; (b) the modern province.

formed the nucleus of the modern kingdom of Spain. Aragon extended over the north-eastern part of the peninsula, while Castile occupied the greater part of what is now Spain, extending from the Bay of Biscay southward.



ARAGON (IN BLACK)

(a) In the time of Isabella; (b) present-day province.

In the great struggle against the Moors, Castile had always played a prominent part, and the additional strength derived from its union with Aragon made possible the death blow to Moorish dominion in Europe (see MOORS). The language of Castile is still the literary language of Spain and to a great extent of the Spanish-speaking countries of South America.

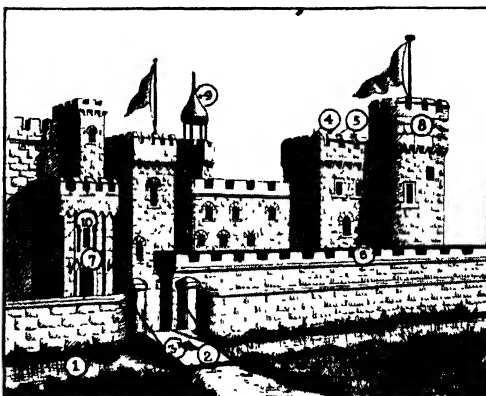
Under the present system of government, Castile is divided into Old and New Castile and again subdivided into provinces, the most important of which is Madrid, in which the capital of Spain is situated. Aragon is now divided into three provinces. See SPAIN (History).

CASTINGS. See EARTHWORK.

CAST IRON. See IRON AND STEEL.

CASTLE, *kas' l*, a word derived from the Latin *castellum*, meaning a fort, applied to an

edifice serving as a residence and a place of defense. The Romans erected permanent fortified camps in their colonies and conquered territories, surrounding them with walls and by other means making them strong enough to resist attack. The castle was a natural evolution from such camps, and originated in the desire for a safe place in which to dwell and in which to store valuable possessions. In the days of feudalism, there was almost constantly a state of war. Each feudal leader gathered his retainers around him and was prepared to protect his possessions by force of arms, or to take from his neighbors what he wanted by the same means. The feudal barons of Europe, the robber chiefs of the Rhine, and the nobles of France, especially, built for themselves castles, some so strong that they could resist any attack. The Crusaders taught Eu-



CASTLE

The fortress of the medieval period

- | | |
|----------------|---------------------|
| (1) Moat | (6) Rampart |
| (2) Drawbridge | (7) Portcullis |
| (3) Wicket | (8) Donjon, or Keep |
| (4) Merlon | (9) Turret |
| (5) Embrasures | (10) Escutcheon |

rope much concerning the art of war and, incidentally, how to build castles.

Sometimes a castle was built to defend a town and to be the residence of the feudal chief, who was paid by the town for protection. A village would perhaps spring up around a castle already built, and its inhabitants would be more secure, feeling that they had a stronghold to which to retire in time of danger. In building a castle, every advantage was taken of position. Sometimes the castle would be perched upon almost inaccessible crags. If placed on level ground the entire building was surrounded by a *moat*—a deep ditch filled with water. Across the moat was a *drawbridge*; this could be raised or lowered at will. The outer wall was of great height and thickness, strengthened at intervals with towers, in which were loopholes through which missiles could be discharged. The main entrance was protected by

a *portcullis*, an armored gate or door, which could be raised to allow free passage or lowered to bar the way completely. An inner wall surrounded the main court, in which was the *donjon*, or keep, the strongest part of the castle, and the residence of the chief and his family. The keep was usually fifty or sixty feet high, with thick walls, sometimes honeycombed with passages leading to all parts of the castle and, in many cases, beyond the outer walls.

The invention of gunpowder rendered the most powerful castle useless as a protection, and though many were built at a later date,



Photo U & U

STIRLING CASTLE, ENGLAND

The type of structure and location which appeals to the imagination and recalls to the mind the stories of proud lords and ladies of days forever gone

they were no longer regarded as strongholds. In many parts of Europe, the ruins of castles may still be seen, and a few have been kept in a habitable state. For the most part, however, they are now merely objects of curiosity to tourists, to be inspected on payment of a small fee. Windsor Castle (which see), having many features of the typical medieval castle, is the magnificent residence of English royalty. Blarney, in Ireland, Kenilworth, in England, and Heidelberg, in Germany, are European castles loved by tourists.

[A graphic description of an attack on a castle is contained in Sir Walter Scott's *Ivanhoe*.]

CASTLE GARDEN. See NEW YORK CITY.

CASTLE PINCKNEY. See MONUMENTS, NATIONAL.

CASTOR AND POLLUX, the twin sons of Zeus and Leda, and the heroes of some of the most picturesque stories in Greek and Roman mythology. They are often called the *Dioscuri*, which means *sons of Zeus*. The "illustrious twins," as Horace speaks of them, were champions of the manly sports, Castor favoring especially the art of horsemanship and Pollux that of boxing. Helen of Troy was their sister. One of their exploits was their invasion of

Attica to rescue her from Theseus, who had carried her off to Athens. This story is a variation of the Grecian myth concerning Helen (see HELEN OF TROY). They also shared in the dangers of the Calydonian hunt, in which the greatest heroes of Greece engaged in order to rid the fields of Calydon of a ravenous boar. They sailed on the Argonautic expedition (see ARGONAUTS).

Castor, who was mortal, was slain in battle, and Zeus, to comfort the grieving Pollux, permitted him to share his immortality with his brother. Thus, the brothers lived one day in Olympus, and the next in Hades. According to another story, Zeus placed them among the stars as Gemini, the Twins.

In Art and Literature. In art, the brothers are usually represented with snow-white steeds. The Romans believed that they rode on their horses at the front of battle during the fight at Lake Regillus. Macaulay, in his *Lays of Ancient Rome*, has a famous description of them:

So like they were, no mortal
Might one from other know,
White as snow their armor was,
Their steeds were white as snow.
Never on earthly anvil
Did such rare armor gleam,
And never did such gallant steeds
Drink of an earthly stream.

Related Subjects. In the article ASTRONOMY, see the subhead *The Stars and Their Names*, also, ZEUS, SAINT ELMO'S FIRE.

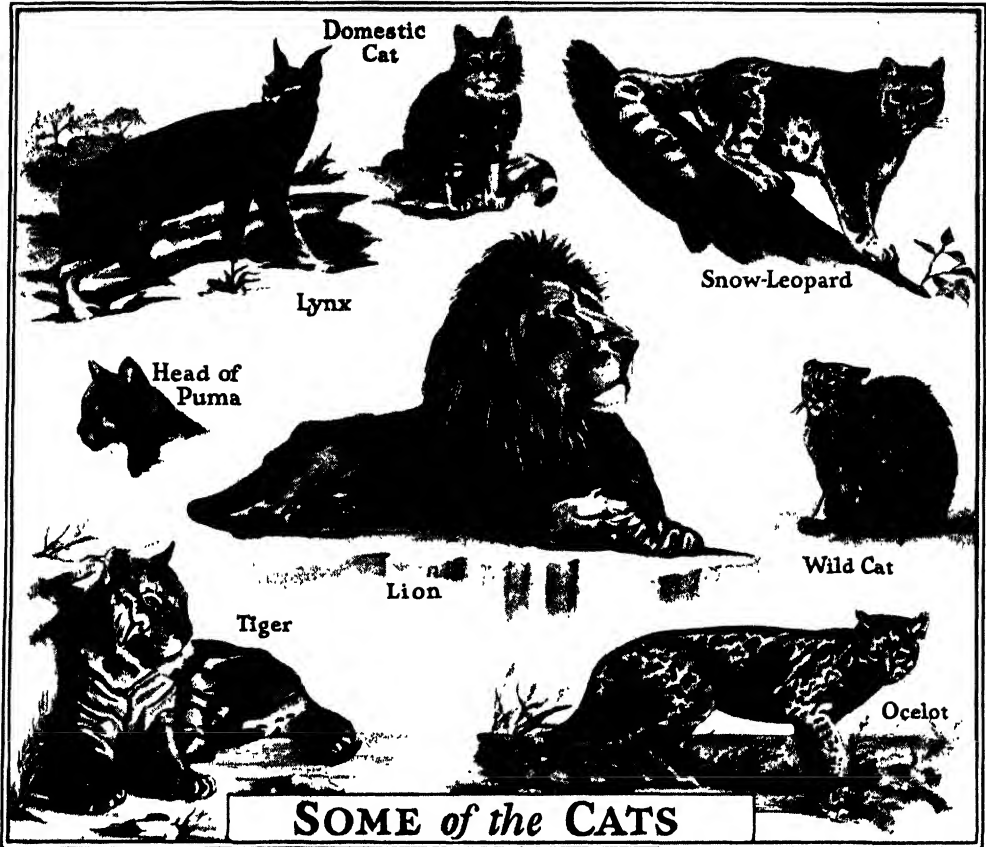
CASTOREUM, *kas toh' re um*, the basis of a perfume. See BEAVER (Commercial Uses).

CASTOR OIL, a widely used purgative obtained from the seeds of a tropical plant belonging to the spurge family. The oil is extracted from the seeds by bruising and pressure, and when fresh, it is clear, nearly colorless, and sticky. It has a mildly irritating effect on the muscles of the intestinal walls, and acts very completely in about five hours. Castor oil should not be taken regularly, because it tends to cause constipation, but it is very useful in special cases. It is useful in counteracting fermentation in the intestinal tract, as a purgative in kidney disease, and as



CASTOR OIL PLANT

Showing, also, flower, bean, and seed.



a remedy for constipation in alcoholism. Some doctors prescribe castor oil after childbirth. The disagreeable taste may be disguised by putting the dose in coffee, milk, syrup, or orange juice; the oil also may be administered in the form of capsules and emulsions, and as an enema.

Castor oil is employed as a lubricating oil, and as a lamp fuel in the East Indies. Most of the commercial supply of seeds and oil comes from India, though the plant is cultivated in tropical and mild regions in various parts of the world, including the South Central United States.

W.A.E.

Classification. The botanical name of the castor-oil plant is *Ricinus communis*. The seeds are borne in a spiny three-lobed capsule, or bean.

CASTRO, CIPRIANO, a Venezuelan politician and revolutionist. See VENEZUELA (History).

CAT. The fiercest animals of the mountain side and jungle are close relatives of the domestic cat. Young kittens, with downy fur and playful ways, are delightful household pets, but if

we study the anatomy of a mature cat, we cannot fail to see its resemblance to the wildcat, the lynx, the tiger, and the lion. The lithe, slender body, short, powerful jaw, sharp teeth and claws, and strong muscles show that it is well equipped for the destruction of animal life.

As a destroyer of mice and rats, the cat is unexcelled, and although a bird enemy, too, its real use to mankind is often underestimated. With eyesight adapted to darkness, and endowed with patience and cunning, the cat watches for prey which is a pest to man. One of the first things a settler in a new country

needs is a cat. Mice are usually so numerous there that without this earnest little watchman it would be difficult to keep necessary stores of food. In many cities, the worth of cats is officially recognized; a definite sum is furnished yearly for the maintenance of cats in many post offices, and public buildings, to keep away the ever-destructive mice. The cat becomes more strongly attached to places than



Photo: St. Clair



Photo: U & U

ON A FISHING EXPEDITION

to people, and will often desert families who have moved, to go back to the old home. Cats enjoy petting, and show jealousy if neglected for other pets.

It is believed that the cat was originally tamed from the wild state and domesticated in Egypt. In that original "granary of the world," the cat was loved and honored. From the Egyptian cat-headed moon-goddess Pasht, it is believed, has come the term *pussy*.

Peculiarities of the Cat. There are a number of things about the cat family, not seen in other animals, which are of especial interest. The most conspicuous of these are the claws. The forefeet of cats have five toes each, the hindfeet four, and every toe is fitted with a sharp, hooked claw so joined to the tip bone of the toe that it can be pulled in or thrown out at will. This makes it possible for the cat to walk softly on the fleshy part of its feet, or to scratch and tear when the need arises.

The eyes of cats hold peculiar interest. The color varies in different kinds from yellow to orange, from blue to emerald green. The pupils can be wonderfully expanded or contracted,

sometimes being just a vertical slit with a pin hole at each end through which the light enters. Because of this power, cats see well in the dark. Hearing and touch are also keen; smell and taste are not. Cats' whiskers are useful as feelers and warn their owners of near obstacles in the dark.

To show their emotions, when pleased and contented, cats cause a vibration deep in the throat, which from the sound is called a "purr." When angry, they hump their backs high in the middle, raise their hair and tails, and glare, spit, and howl.

To drink, cats lap up milk or water with the tongue. When they catch mice or other animals, they seem to delight in playing with the victim, holding it a short time, then letting it free, and again with a quick movement catching the creature and shaking it; this routine continues until they finally put an end to the life of the unfortunate subject of their playfulness.

Objections to Cats in Families. In spite of the usefulness of cats, some people will not keep them as pets, for it is true they have treacherous instincts. One minute a cat may be



Photo: Wide World

purring happily; the next, its claws may be out, scratching and tearing. So a cat is not always a good pet for a child. Then, too, cats delight in killing birds. It is charged that

the cat, as many people suppose, but to the fur, which is usually yellow, marked with orange, red, brown, or black. M.J.H.

Scientific Name. The cat family is known scientifically as *Felidae*. The domesticated cat is *Felis domestica*.

Related Subjects. The wild members of the cat family are described in these volumes under the following titles.

Cheeta	Lynx	Puma
Jaguar	Ocelot	Serval
Leopard	Ounce	Tiger
Lion	Panther	Wild Cat

Outline for Essays on the Cat

Why I Love My Cat

- (1) Its beauties
 - (a) Soft fur
 - (b) Markings
 - (c) Bright eyes
 - (d) Graceful tail
 - (e) Long "whiskers"
- (2) Its cleverness
 - (a) How it found its way home when stolen
 - (b) Its ability to catch mice
 - (c) How it drove away the dogs that would have harmed its kittens
- (3) Its affectionate ways
 - (a) Likes to rub against people
 - (b) Its satisfied purr
 - (c) Its fondness for curling up in my lap

A Cat's Story

- (1) Where I was born
- (2) My brothers and sisters
 - (a) Number
 - (b) Description
- (3) Why I was given away
- (4) My new home
 - (a) The place
 - (b) The people
- (5) Why I like girls better than boys
 - (a) They feed me
 - (b) They are not rough with me
- (6) My little mistress
 - (a) Description
 - (b) Her treatment of me
- (7) What I like best
 - (a) The warm corner
 - (b) My favorite food

cats are unclean animals and carriers of disease; the truth, however, is that if a cat is given a fair chance in life, it keeps itself one of the cleanest of pets

Cat Aristocrats. Among the various breeds or races of cats now carefully bred for the cat shows, two of the most curious are the tailless *Manx* cat, or rabbit-cat, and the *Persian* cat, with its long, silky fur. The *tortoise-shell*, the color a mixture of black, white, and brownish or fawn color; the large *Angora*, and the blue, or *Carthusian* and *Maltese* cats, with long, soft, grayish-blue fur, are the species most admired by the lovers of cats. The name *tabby* is derived from a street in Bagdad-Attab—celebrated for its manufacture of watered or moiré silks, in England called *taffeta*. The word *tabby-cat* does not refer to the sex of

CATACOMBS, *kat' a kohmz*, subterranean galleries and caves forming the usual burial places of the early Christians, who did not practice cremation. Either as communities or families, they bought plots of land, under the surface of which they excavated cemeteries, or crypts. The term *catacomb* is said to have been applied originally to the district near Rome which contained the chapel of Saint Sebastian, in the vaults of which, according to tradition, the bodies of Saint Peter and Saint Paul were first deposited.

The catacombs of the early Christians of Rome consisted of long narrow galleries, usually about eight feet high and five feet wide, branching off in all directions, forming a perfect maze of corridors. When one story was no longer sufficient, staircases were made, and a second line of galleries was dug out beneath. The graves, or *loculi*, to receive the bodies, were cut into the walls of the gallery, one above another. They were closed laterally by a slab on which there was occasionally a



CHRIST AS THE GOOD SHEPHERD
A symbol of the love and faith of the early Christians.

a brief inscription or a symbol, such as a dove, an anchor, or a palm branch, and sometimes all of these. Some of the inscriptions and epitaphs were beautifully carved, some merely scratched upon the slab, and others were painted in red and black. In later times, beautiful frescoes were common, in which are indicated the Christian faith and devotion.

It is now regarded as certain that in times of persecution the early Christians frequently took refuge in the catacombs, since burial places had the right of protection by law, and they also gathered there to celebrate in secret the ceremonies of their religion. The practice of burial in the catacombs completely disappeared in the beginning of the fifth century, and the existence of such subterranean



Photo: U & U

Catacombs at Palermo, Sicily. On each side of arched corridors are hundreds of mummies and skeletons, some in coffins and some simply laid on shelves. Still others are suspended in sitting or standing positions against the walls. Some of the remains, in coffins, may be viewed through glass sides.

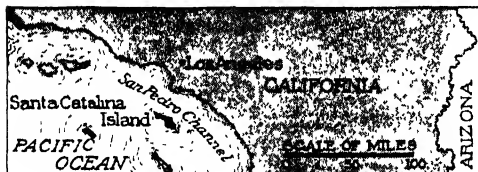
burial grounds was forgotten. Six centuries later, excavations laid bare what were then supposed to be the ruins of previous cities.

The term has also been applied to ancient subterranean quarries in Paris, which have been used since 1786 as burial places. It is said that 6,000,000 bodies lie in these catacombs, where the bones are arranged in fanciful designs along the sides of the passages. There are also extensive catacombs in various Italian cities. See DOVE.

CATALEPSY, *kat' a lep sie*, a term applied to a condition in which a person suddenly becomes unconscious and remains rigidly fixed in the attitude assumed when the attack commenced. The seizure may terminate quickly or it may continue for some time. The action of the heart and lungs continues, and the pulse and temperature remain natural. This condition is related to hysteria and some forms of insanity. Catalepsy has often been mistaken for death, and cases are on record in which full preparation for burial had been made before the mistake was discovered. The assertion has been made that occasionally persons in a cataleptic state are buried alive, but there is no substantial evidence in support of this.

W.A.E.

CATALINA, *kat a le' nah*, **ISLAND**, also known as **SANTA CATALINA**, a favorite California resort, is one of the Santa Barbara Islands, near Los Angeles. It is from one to four miles wide and about twenty-two miles long. Most of the island is owned by William



LOCATION MAP

Wrigley Jr., a gum manufacturer. He discovered extensive coal deposits on his land in 1924. The surrounding waters abound in fish, and following the policy of conservation of natural resources by act of the California legislature, Catalina has been made a fish reservation. Formerly the canning of tuna was rapidly exhausting the supply of that fish; as many as 150 fishing launches were seen there each day. Tourists visit Catalina in constantly increasing numbers. They are invited to view the wonderful marine gardens in glass-bottomed boats; the sight is a never-ending source of wonder and delight, for one sees a rainbow of color, a gracefully moving mass of curious shapes—starfish, octopus, long-armed jelly fish, angel-fish, sea cucumber, crab, and squid—of varied colors, moving in the clear water. See illustration, page 754.

CATALPA *ka tal' pah*, OR **INDIAN BEAN**, common names of a genus of rapidly growing shade and ornamental trees belonging to the bigonia family. The catalpa of the United States is grown extensively as a shade tree, and is a most beautiful sight in early summer, when its masses of large, heart-shaped leaves



Photo Visual Education Service

THE WELL-KNOWN CATALPA TREE

are almost hidden by the thick clusters of white, purple-tinged flowers. In the axils of the primary leaf veins are glands containing nectar. When bruised the leaves have a disagreeable odor. After the flowers come the seed receptacles—long, slender pods that remain on the trees all winter. In the spring they split and release the winged seeds [see SEEDS, (Seed Dispersal)]. Catalpa wood is light and soft, but is serviceable for furniture, posts, railroad ties, and woodwork. G.M.S.

Scientific Name. The scientific name of the bigonia family is *Bignoniaceae*. The species described above is *Catalpa catalpa*.

CATALYSIS, *ka tal' i sis*. This is a process little understood by chemists, but one that has numerous applications, especially in modern industry. Any substance that speeds up or retards the chemical action between two other substances, without itself being changed in nature, is called a *catalyst*, or *catalytic agent*. The process is *catalysis*. Almost any substance can act as a catalyst under proper conditions, and the metals, especially, are of great importance in the industrial applications of catalysis. The enzymes of the stomach, essential to digestion, are examples of physiological catalysts.

Heretofore, when men wanted to get more gasoline from petroleum, they knew no other way to get it than to break up the complex molecules into simpler ones, to break down the heavy oils to make light oils. This "cracking" process was regarded as a great achievement in its day, and brought fame and fortune to its inventor. But the world is now passing into another era, the age of synthesis, when the chemist builds up instead of breaking down. Starting with the commonest and cheapest materials, air, water, and coal, the chemist can construct at will all sorts of valuable compounds for which we formerly had to rely upon nature. A French chemist opened the door to this new era with catalysis as his key. Shortly before the last century closed, he found that hydrogen gas could be made to unite with carbon-monoxide gas in the presence of finely divided nickel and produce methane, well known as natural gas. In this case, nickel was the catalytic agent. Now these two constituents, hydrogen and carbon monoxide, are easily made by passing steam over red-hot coal, the "water-gas" process. Many other metals and compounds have since been found to act like nickel as a catalyst; that is, they produce a chemical change by their mere presence, without being used up or appearing among the products. This principle was later applied with remarkable results by another Frenchman, and still more extensively in Germany by the director of the Institute of Coal Research.

These scientists disclosed that we have been making methanol (wood alcohol) by the old-fashioned method of distilling wood, but now a German company makes ten to twenty tons of it a day from water gas at a cost of only twenty cents a gallon. Wood alcohol has long been employed in all countries as a denaturant for industrial alcohol, and has caused many cases of blindness in Germany and America by being used as a beverage by those who do not know one alcohol from another. Various other alcohols, such as butyl alcohol, made in America by fermenting corn and used for automobile lacquers, are made in Germany from water gas. The waste gases that in some sections of the United States are still allowed to escape unused from coke ovens, are at the mines in France cooled, condensed, and utilized for making methane, benzene, ethyl alcohol, and ammonia.

Owing to a German catalytic process for synthetic ammonia, Germany is now exporting fertilizer instead of importing it. About 425,000 tons of free nitrogen from the air are made available for fertilizers by catalysis every year, and this output takes the place of thousands of tons of Chilean nitrate.

Benzine, which can be made from coal in various ways, is the mother substance of the aromatic family of chemical compounds, a

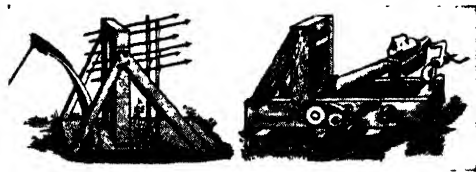
family of many thousands, and rapidly growing. Among these are the aniline dyes and drugs that have made the world brighter and safer in our generation. By catalysis, too, whale oil is made suitable for soap manufacture, the vulcanization of rubber is hastened, and glucose is produced from corn, potatoes, and other starchy plants.

The chief stimulus to such investigations in Europe is the search for home-made motor fuel. Americans do not appear to be interested in this question now, but some day they will be; in the meantime, it is interesting to watch the chemists in Europe experimenting to see how many different products they can derive from common coal (see full-page illustration under COAL).

CATAMOUNT. See WILD CAT.

CATANIA, *ka ta' nih ah*, a seaport of Sicily (which see).

CATAPULT, *kat' a pult*, a machine which works on the same principle as a crossbow, used by the ancients to throw heavy missiles, chiefly stones or bars of iron. The toy weapon



THE CATAPULT

At the left, the machine projected a number of arrows at one time; that at the right threw a large stone when the spring was released. Such instruments of destruction were common for hundreds of years.

of this same nature now used by boys and called a slingshot in the United States and Canada is described under the title SLING. In the trench fighting prevailing in the World War, various forms of the ancient catapult were revived and found effective, throwing poison-gas missiles straighter and for a greater distance than they could be hurled by hand. Some of the missiles were bombs or grenades, sometimes of primitive manufacture, consisting merely of tin cans filled with gunpowder or dynamite ignited by means of a fuse. In some cases a stick served the purpose of a catapult; one end was stuck deep into the ground and to the other was attached a loop of cloth, leather, or rope. The bomb was placed in the loop, the stick was bent as far as possible and suddenly released; it sprang back into an upright position and hurled the bomb into the hostile trenches.

CATARACT. See WATERFALL.

CATARACT, *kat' a rakt*, a disease of the crystalline lens of the eye, through which this structure becomes relatively hard and opaque. When a cataract is hard and no longer permits

the passage of light, it is said to be ripe. Among the causes of cataract are exposure of the eyeballs to glare, heat, dust, senility, diabetes, gout, and glaucoma. The symptom of cataract is a progressive loss of vision in one or both eyes. This leads to an examination with the ophthalmoscope (which see). The treatment of cataract consists in an operation for the removal of the opaque lens.

Opacities of the lens cannot be removed by medicines dropped in the eyes or by eye exercises. To prevent cataract, the causes should be avoided. See EYE. W.A.E.

CATARRH, *ka tahr'*, a loosely used term applied to inflammations of any membrane which secretes mucus. The term is being gradually abandoned. See CORYZA. W.A.E.

CATAWBA, *ka taw' bah*. See INDIANS, AMERICAN (Most Important Tribes).

CATBIRD, a North American songster of the mocking-bird family, so named because one of its calls is like the mewling of a cat. Its warble, however, is sweet and musical, and it imitates the song of other birds with almost the skill of its relative, the mocking bird. It often sings for hours on warm, moonlight nights. The slate-gray plumage of the catbird, both male and female, is the color of the fur of a Maltese cat. Head and tail are black, and there is a reddish-brown patch beneath the tail.

These birds are about nine inches long. They are interesting visitors to have in the garden, as their lively ways and funny antics are always amusing. They seek tangled thickets and garden shrubbery rather than the open, and hide the loosely built nests where the brush is thick. Three to six bluish-green eggs are laid. Catbirds occasionally feed on cultivated fruits, but somewhat offset this thievery by devouring beetles, ants, crickets, and other forms of injurious insect life. In summer, they are found throughout the United States west to the Rocky Mountains, and in Southern Canada; they spend their winters in the Southern states, and in Cuba, Mexico, and Central America. D.L.

Scientific Name. The catbird belongs to the mocking-bird family, *Mimidae*. Its scientific name is *Galeoscoptes carolinensis*.

CAT BRIER. See GREEN BRIER.

CATECHISM, *kat'e kiz'm*, a system of religious questions and answers used for instruction in the truths and duties of the Christian sects. The first regular catechisms, compiled in the eighth and ninth centuries, were drawn for the guidance of catechumen (those receiving rudimentary instruction in the doctrines of Christianity). Among the chief catechisms are the Lutheran, published by Luther (1529) and accepted as standards of the Lutheran Church, Genevan, the work of Calvin (1536); Heidelberg or Palatinate Catechism (1563), compiled by Heidelberg theologians and still used by the Dutch Reformed Church; Anglican (1549-1604), contained in the Book of Common Prayer; Tridentine (1566), prepared in accordance with the decrees of the Council of Trent, and of high authority in the Roman Church, the Shorter (1647) and Larger (1648) Catechisms, prepared by the Westminster Assembly and used by the Presbyterian Church; and one for Methodist adherents.



ITS FOOD



Photo Visual Education Service

CATBIRD AND NEST

CATECHU, *kat' e-choo*, a resinlike substance used in tanning, dyeing, calico printing, and in medicine. It is obtained chiefly from the wood of various

acacia trees native to India. The bark is removed for use in tanning, and the heartwood is cut up into pieces and boiled in water until a tarry substance results. After this has partially hardened, rough blocks or balls of it are wrapped in large leaves, and in this form it is placed on the market. Catechu, or *cutch*, yields a coloring matter that produces rich shades of brown. This dye is much used in combination with logwood to color silk. Catechu has astringent properties, but as a medicine it has been superseded by a similar product, gambier, obtained from a shrub of the madder family. See DYEING AND DYESTUFFS. T.B.J.

CATERPILLARS

1. Trifenstrata;
2. Bradmanet;
3. Bradmanet;
4. Simlax;
5. African Binaen;
6. Cythessa;
7. Deleogoguel;
8. Two-toothed;
9. Red-humped;
10. Apple;
11. Olive;
12. Tulip-tree Silk;
13. Borealls;
14. Puss;
15. Walnut-leaf;
16. Appalachian;
17. Transparent;
18. Dytana;

17. Stragula;
18. Guttunitta;
19. Royal Walnut;
20. Snaky;
21. White Parched;
22. Spice-bush Silk;
23. Dusky;
24. Caciens;
25. Unicorn;
26. Yellow Parched;
27. Buck;
28. Artends Buck;
29. Yellow-necked;
30. Glover's Silk;

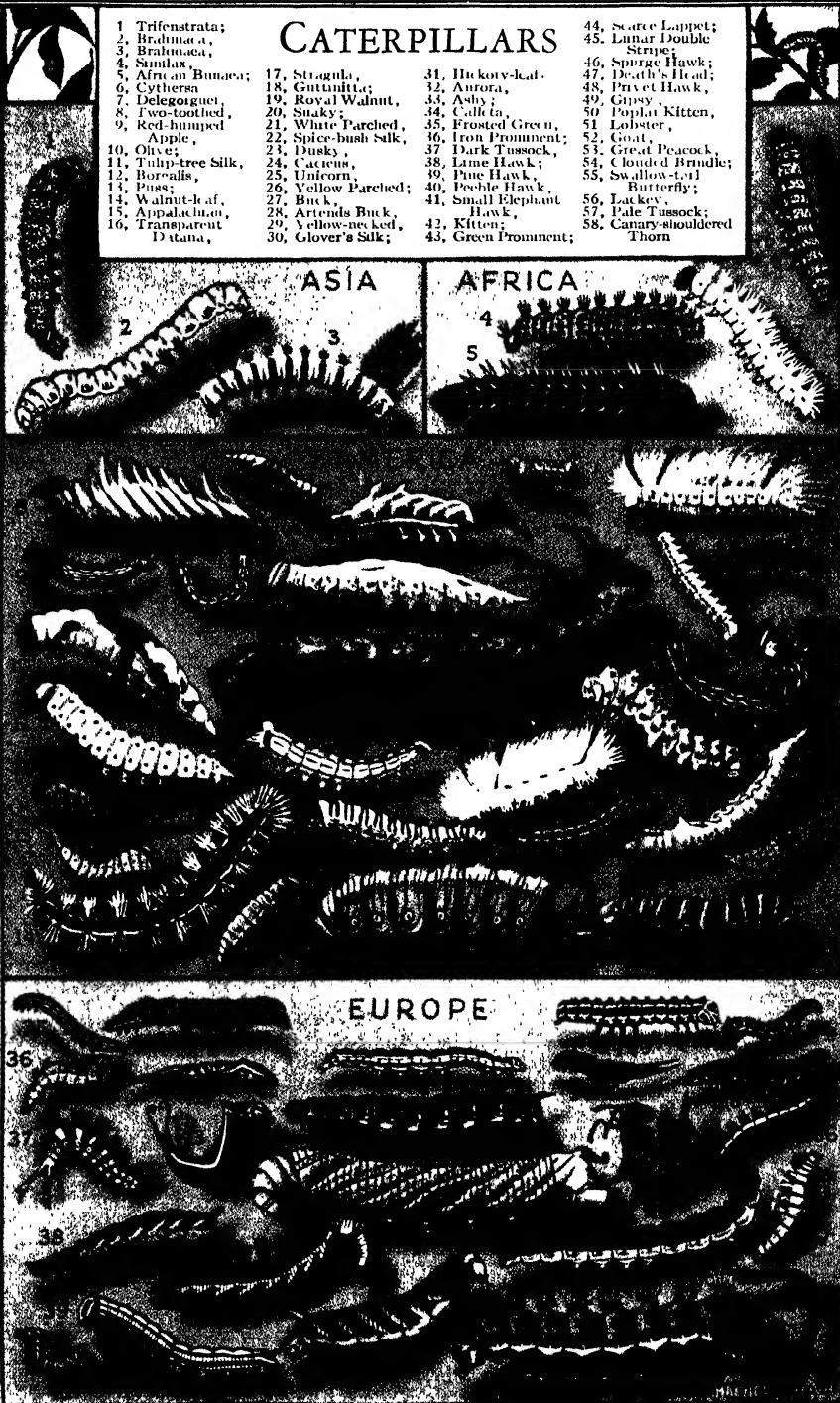
31. Hickory-leaf;
32. Anrora;
33. Ashy;
34. Callita;
35. Frosted Green;
36. Iron Prominent;
37. Dark Tussock;
38. Lame Hawk;
39. Pine Hawk;
40. Peeble Hawk;
41. Small Elephant Hawk;
42. Kitten;
43. Green Prominent;

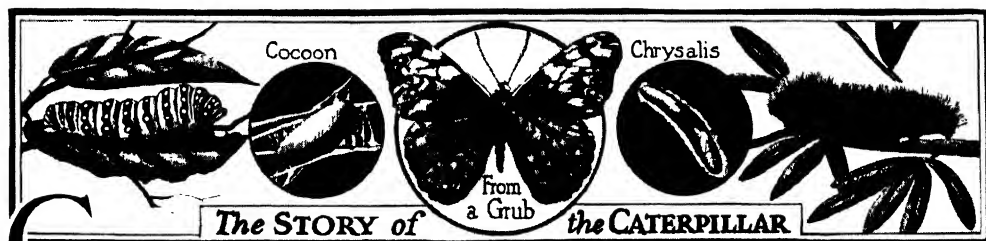
44. Scarce Lappet;
45. Lunar Double Stripe;
46. Spurge Hawk;
47. Death's Head;
48. Privet Hawk;
49. Gipsy;
50. Poplar Kitten;
51. Lobster;
52. Goat;
53. Great Peacock;
54. Clouded Brindle;
55. Swallow-tail Butterfly;
56. Lackey;
57. Pale Tussock;
58. Canary-shouldered Thorn;

ASIA

AFRICA

EUROPE





CATERPILLAR. This wormlike creature bears somewhat the same relation to a butterfly that an ugly, rough bulb bears to a stately lily; for from this crawling thing, which is to most people one of the most loathsome of living objects, there develops in time the most beautiful of all the insects, a moth or butterfly. The curious name probably means *hairy cat*; it thus would really seem to belong to the woolly caterpillars only, but it is applied as well to the hairless ones.

The Story of a Caterpillar. Molting. When the egg of a butterfly hatches, it is a tiny caterpillar which crawls out; and as the butterfly has taken care to place the egg near some plant, it finds its food near at hand. At once it begins to eat and to grow, but its skin does not grow with it as does the skin of most animals. Soon this becomes too tight, and the caterpillar prepares to throw it off. A split appears on the upper part, near the head end, and the caterpillar then wriggles itself out, appearing in a new soft skin which has been folded in under the old one. In a few days this, too, is in turn outgrown, and the process is repeated four or five times before the caterpillar is fully grown. In the temperate regions, most species remain in the caterpillar state for two or three months, but in cold climates, where they pass the winter in a condition of inactivity, longer intervals elapse between successive molts. Some species of the Arctic regions take from two to three years to pass from the egg to the butterfly state.

Structure. A caterpillar usually has twelve rings or segments, not including the head, and to each of the first three of these is attached a pair of five-jointed legs. These develop later into the legs of the perfect insect, but the feet or leg stumps on the abdomen are not really legs and are shed with the last skin. Occasionally, as in the so-called measuring worm, there is but one pair of legs on the abdomen, and the larva moves by drawing these hind legs up to the front pair, thus forming a loop or arch of its body.

The head has six eye spots on each side, a pair of short, jointed feelers, by which the caterpillar guides itself in moving, and strong, biting jaws which are very different from the sucking mouth-parts of the butterfly. The

body may be naked or covered with hairs, bristles, or spines, which in caterpillars living an exposed life are often brightly colored. On the skin of the hairless species, there frequently appear lines, eye spots, or ringed spots of bright colors contrasting with that of the body, and many a caterpillar might by reason of its color be considered really beautiful if it were not for its wormlike appearance. For more details of the part played by the caterpillar in the development of a moth or butterfly, see articles on those insects.

Protection. Like most living things, many caterpillars have ways of protecting themselves from attack. Some of them make nests for themselves of rolled leaves or of spun silk; some burrow into plants. In some species, there are present glands which secrete an unpleasant fluid, while with others it is a sickening taste which saves them from being eaten by other small animals. But in spite of these devices a very, very small proportion of the caterpillars that are hatched ever come to the cocoon-building stage, for not only do larger animals eat them, but tiny parasites burrow into their bodies and kill them.

Feeding of Caterpillars. Mature butterflies do no harm, and the cocoon of the moth or chrysalis of the butterfly is to all appearance a lifeless thing needing no food, but caterpillars are heavy eaters, and it is this which makes them a serious menace. A few, as the silkworms (see **SILK**), are valuable, but most of them do nothing to pay for what they devour. One of the things that makes farming hard work is the constant fight that must be waged against caterpillars and other pests, for roots, leaves, flowers, and fruit have all their particular enemies. Sometimes, in years when caterpillars are especially numerous, great fields are made bare of vegetation, and orchard, forest, and shade trees are stripped of their leaves. Exceedingly troublesome are such pests as the cabbage worm, the cotton worm, the army worm, and the cutworm. In most countries, the governmental departments of agriculture have made special studies of these plant enemies, and they willingly furnish to the farmers information relating to the best means of fighting them.

W.J.S.

Related Subjects. The reader is referred in these volumes to the following articles

Army Worm	Cocoon	Measuring Worm
Butterfly	Corn Borer	Molting
Cankerworm	Corn Earworm	Moth
Chrysalis	Cutworm	Tent Caterpillar

CATESBY, ROBERT. See GUNPOWDER PLOT.

CATFISH. This name is applied to a large group of fishes possessing protective spines on the fins, and sensory "whiskers," or barbels, around the mouth. They lack scales, though in some species there are bony plates. Catfish have the interesting and unusual habit of making nests in sheltered places, keeping watch over these, and guarding their young until they can take care of themselves. These fish are distributed freely over the United States in fresh waters. The largest and most important species for food is the *blue catfish* of the Mississippi Valley, a gamy fish ranging in weight from a few pounds to 125. The *spotted catfish* of the Mississippi Valley and Great Lakes attains a maximum weight of twenty-five pounds. Both of these have forked tails. The common *bullhead* (also called *horned pout*) and *black bullhead* are species of catfish with round tails. These fish are found as far west as the Dakotas and Texas, and are favorites with anglers because they bite any kind of bait. Both are good food fish. L.H.



Photo. St. Clair

THIS IS THE COMMON BULLHEAD

Scientific Names. The blue catfish is *Ictalurus furcatus*; the spotted catfish is *Ictalurus punctatus*. The common and black bullheads are members of the genus *Ameiurus*, and are called respectively *A. nebulosus* and *A. melas*.

CATGUT, the material used for strings in musical instruments, in tennis rackets, for whipcord, for sewing wounds in surgery, and hanging clock weights. It is made from the intestines of sheep, occasionally from those of horses, asses, and mules, but never from a cat's intestines. Catgut is prepared by careful cleaning, soaking, and scraping with a blunt knife. The matter scraped off is used for racket cords. The scraped intestines are then further treated to destroy all animal matter, before final preparation for the different uses named. The finest strings, known as *Roman strings*, come from Italy. Ill-fed animals yield the toughest catgut.

Derivation. The word is believed to be derived from *kii*, meaning *guitar* and *gut*, meaning *to pour*, as derived from the Greek *kithera* and *chein*.

CATHARINE, kath' ah rin, also spelled Catharine, the name of two rulers of Russia.

Catharine I (1684-1727), wife of Peter the Great, and after his death, empress. Born of poor parents, who died when she was three years old, she never received an education. In 1701 she married a dragoon

of the Marienburg garrison. When the town was taken by the Russians in 1702, she fell into the hands of a Russian officer, with whom she lived for a time. He, in turn, passed her on to another, and finally she was taken by Peter the Great. She acquired a wonderful influence over him, because of her active and practical mind, and in 1712 he married her. In 1724 she was crowned at Moscow, and on the death of her husband, a palace intrigue made her his successor. Though immoral and unlearned, she had charm and an active mind, and did much for Peter and for Russia. Of eight children born to Peter and

Catharine, only two grew to maturity. One of these, Elizabeth, was later empress. See PETER I.

Catharine II (1729-1796), a firm, talented empress of Russia, but an unprincipled woman with two ruling passions—love and ambition. So profoundly did she influence her country that she became known after her death as **CATHARINE THE GREAT**. She was of German birth, but in 1745 she was married to Peter, nephew of the Empress Elizabeth. Peter came to the throne on the death of Elizabeth, in 1762. But Catharine, whose married life was not happy, won over the Imperial Guards, with the assistance of the Orloff family and others, and after Peter had reigned for a few months he was deposed, thrown into prison, and afterward killed. Catharine was then proclaimed empress.

On the death of Augustus III of Poland, she caused one of her favorites to be placed on the throne, and by this she profited in successive partitions of that country. By the war with the Turks, which occupied a considerable part of her reign, she conquered the Crimea and opened the Black Sea to the Russian navy. Her dream, however, of driving the Turks from Europe and restoring the Byzantine Empire was not to be fulfilled. She improved the administration of justice and the condition of the serfs, constructed canals, founded the Russian Academy, and in a variety of ways contributed to the enlightenment and prosperity of the country. Her enthusiasm for reform, however, was checked by the events of the French Revolution, for she felt that that great upheaval was caused by giving the common people too exalted an idea of liberty. Gross immorality characterized her private life, yet with all her faults, Catharine II was one of the most remarkable sovereigns of modern times.



Photo. Brown Bros

CATHARINE THE GREAT

CATHARINE DE' MEDICI, kath' ah rin day may' de che (1514-1580), one of the most unscrupulous queens in history, the wife of Henry

If of France and mother of three French kings. The daughter of Duke Lorenzo, one of the famous Italian family of the Medici, she went to France schooled in the selfish political principles of sixteenth-century Italy, and her whole course was directed by her unbounded personal ambitions. Catharine began to interfere in state affairs in the reign of her son Francis II, and on his death in 1560, she took the entire government into her hands, for the new king, Charles IX, was only a boy of ten.

She deliberately encouraged the hostility between Roman Catholics and Protestants, playing off one party against the other and taking care that neither should obtain the balance of power. Alarmed by the growing strength of the Protestant faction, led by the Prince of Condé and Admiral Coligny, she planned the Massacre of Saint Bartholomew's Day (August 24, 1572), to which she persuaded her weak son Charles IX to give his consent. Her course of intrigue continued through the reign of her son Henry III, and she died with scarcely a friend to mourn her loss.



Photo: Brown Bros.

CATHARINE DE' MEDICI

Related Subjects. The reader is referred in these volumes to the following articles:

Coligny, Gaspard de
Henry (II, France)

Huguenots
Saint Bartholomew's Day

CATHARINE OF ARAGON, *air' a gon* (1485-1536), the first of the six wives of Henry VIII of England, who quite without any fault of her own figured in a famous divorce suit that had an important effect on the English Reformation. Catharine was the daughter of Ferdinand and Isabella, the Spanish monarchs who started Columbus on his voyage to the New World in 1492. At the age of sixteen she became the wife of Arthur, Prince of Wales, son of Henry VII of England. Five months after the marriage Arthur died, and the king, because he wished to keep Catharine's dowry, arranged for her a marriage with his second son, Henry, then a boy of twelve (see HENRY VIII). As the two were already so closely related by her first marriage, a dispensation from the Pope had to be obtained to make this marriage legal.

Henry and Catharine were married in 1509, immediately after he came to the throne, and lived together for twenty years. Five children were born to them, only one of whom, their daughter Mary, lived. Henry's disappointment in not having a son to succeed him was bitter,

and he pretended to see in this a sign of Heaven's displeasure because he had married his brother's widow. His love for Anne Boleyn, the queen's beautiful maid of honor, determined him to have the first marriage annulled; he obtained a divorce from Catharine, and married Anne. This course of action brought about a separation of the English Church from the Church of Rome, and was the beginning of the Reformation in England.

Catharine lived in retirement after her divorce, and though persecuted by agents of the king, refused to the last to sign away her rights or those of her daughter Mary. See MARY (I, England).

CATHARINE THE GREAT. See CATHARINE (II, Russia).

CATHAY, *kath a'*, a name formerly applied to China, but now used only in poetical allusions to that country. The northern provinces of China were conquered about A.D. 907 by the hordes of "Khitai," and Marco Polo, in writing about the country, called it by their name. Tennyson in *Locksley Hall* writes, "Better fifty years of Europe than a cycle of Cathay." See COLUMBUS, CHRISTOPHER; POLO, MARCO.

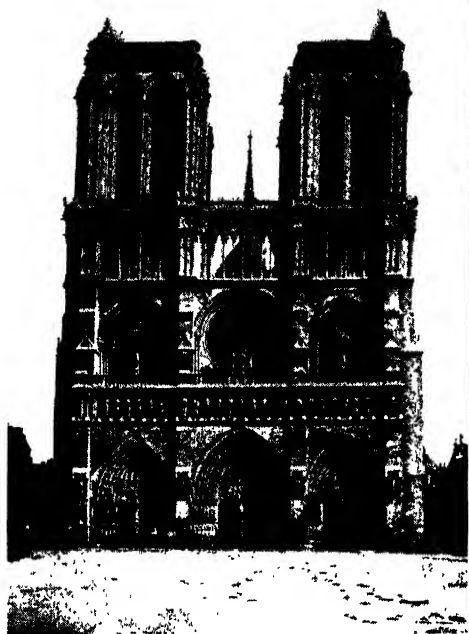
CATHEDRAL, *ka the' dral*. To almost anyone this word brings an immediate and a vivid picture—the view of a great, gray stone building with towers pointing skyward, with pointed arches and elaborately carved rose windows. It is not a new building, this picture cathedral, but has century-old legends clustering about it as thickly as the ivy which shrouds it. All of these picturesque details, however, are not essential to the idea of a cathedral, which may be but a tiny church if it have one important thing beneath its roof. This is the chair or throne of the bishop, for *cathedra* means *seat*, and any church structure which contains this is a cathedral church, or more briefly, a cathedral. In any bishop's province, or diocese, there can be but one such church, and because this is likely to be the largest and wealthiest one, the idea of stately magnificence has grown up naturally about the word.

America, like Europe, has its cathedral in every bishop's province, and some of these are beautiful structures. The Cathedral of Notre Dame in Montreal, Canada, is one of the largest religious buildings in all North America; in Albany, N. Y., is the Roman



Photo: Brown Bros.

CATHARINE OF ARAGON



THE GREAT CATHEDRAL OF NOTRE DAME, IN PARIS

The front of the building, and the nave, the latter a fine example of a Gothic interior

Catholic Cathedral of the Immaculate Conception, a fine example of Gothic architecture; New York City has the splendid Saint Patrick's Roman Catholic Cathedral, which is one of the most magnificent of all church buildings in the United States.

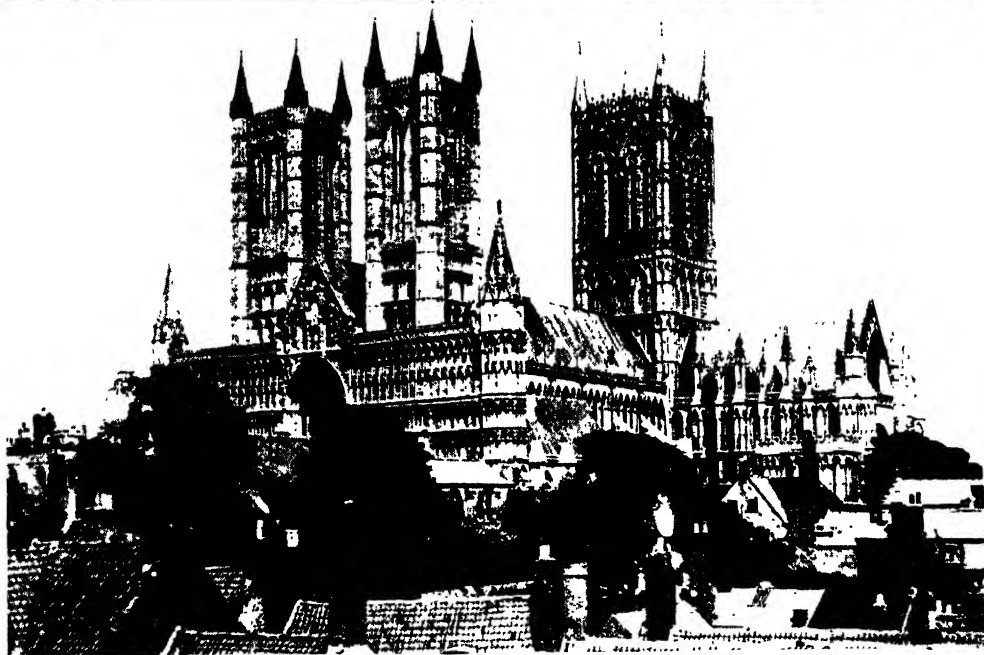
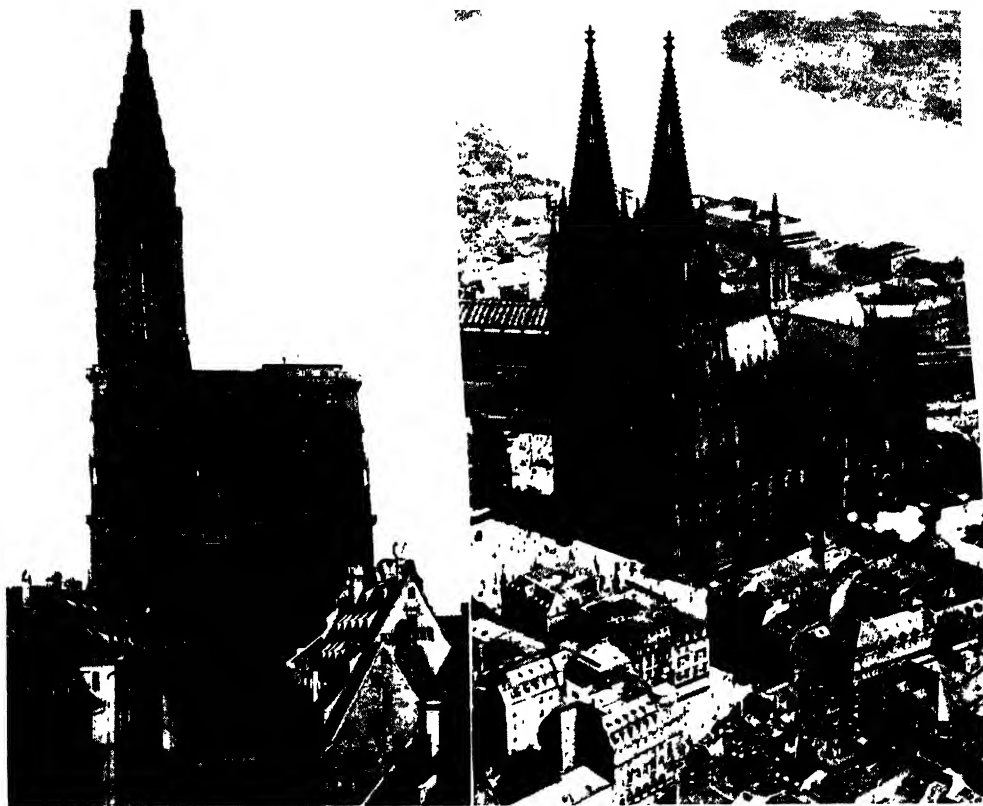
Two famous Protestant Episcopal cathedrals are in the process of construction in the United States; they are the Cathedral of Saint John the Divine in New York City and the Cathedral of Saints Peter and Paul on Mount Saint Albans in Washington, D. C. The former was begun in 1872, but more than half a century later is uncompleted.

The builders of the cathedrals of the Middle Ages would be speechless with surprise if they could see the huge power-driven saws and drills which shape the stone used in modern cathedrals; the cost of the material would be no less astonishing. In the building of the cathedral of Saints Peter and Paul, more than 250,000 stones, each separately designed and shaped to fit its place, are required. The cheapest of these cost \$10 each, while the 5,000 elaborately sculptured stones cost \$300 each.

How the Great Cathedrals Were Built. The glory of the word, however, comes not from these comparatively new structures, but from those wonderful buildings of Europe which date from the Middle Ages. When Peter the Hermit (which see) preached the First Crusade, he roused that religious fervor which is mainly responsible for the erection of the great cathedrals.

Some might go on this crusade and on those which followed, but some must stay at home, and the latter sought a way to show that their devotion was as great as that of those who marched to fight the infidel. Great gifts were made by the wealthy, and the returning crusaders brought back rich trophies, but a large part of the vast sums needed came from the poor peasants at home. They denied themselves, they saved, they even worked for days at a time helping to drag the great stones, sometimes for long distances, which went into these holy buildings.

A tale is told of one woman who was so poor that she could give nothing at all, but she walked day by day beside the oxen which drew the loads, and fed them wisps of grass. Thus the cathedrals which constitute the very finest examples of the art of the Middle Ages are monuments not only to the victory of the Cross over the infidels, not only to the artistic sense and exquisite workmanship of the times, but to the extraordinary devotion of the people. Sometimes a cathedral would be centuries in building, and the fervor must often have flagged, but the religious purpose was kept always in view, and it is said that in no structure ever erected is there so little evidence of the tendency to slight work because it will not be seen; the most minute carving in the farthest and darkest corner is as carefully done as the sculpture over the great central doors.



Notable Cathedrals. Robert Louis Stevenson (in *Inland Voyages*) said: "I never weary of great churches. It is my favorite kind of mountain scenery. Mankind never was so happily inspired as when it made a cathedral." Those pictured above are in Strassburg (Alsace, France), Cologne (Germany), and Lincoln (England).

The Most Famous European Cathedrals. In general, a great cathedral was built in the most conspicuous place in a city, and stood as a landmark for miles around, its towers far overtopping the roofs of the town. No special style of architecture was prescribed for cathedrals, but most of those in England and many of those on the Continent are Gothic in style and cross-shaped in arrangement, hav-



Photo: OROO

SAINT PAUL'S CATHEDRAL

ing chapterhouse, cloister, chapels, and crypt connected with them.

Among the most noted on the Continent are the Cathedral of Milan; the great cathedral at Florence, with its huge dome and magnificent campanile, the whole constituting one of the finest examples of the Italian-Gothic style; the wonderful Cologne Cathedral; the Cathedral of Notre Dame at Paris, with its celebrated gargoyles; and the cathedrals of Amiens and Rheims, which suffered great damage in the World War. All over the world there was a feeling of the profoundest regret at the

destruction visited on these buildings, and their gradual restoration was a source of universal satisfaction.

In England there are the cathedrals of Canterbury, York, Salisbury, Lincoln, and Exeter, and, perhaps the most famous of all, Saint Paul's in London; Scotland has but two, those of Glasgow and Kirkwall. Detailed description of these is impossible here, but many of them are described under their titles or under the names of the cities in which they are located. For the reader interested in art, few more inspiring subjects could be suggested than these cathedrals which date from the Middle Ages, for they are practically an epitome of contemporary art.

Cathedral Architecture. The floor plan of the earliest cathedrals was, in general, the shape of a Latin Cross, and many of the finest cathedral churches have this type of construction. The space corresponding to the arms of the cross is called the *transept*; the arms are usually designated as *north transept*, *south transept*, etc. The long central section, which is beneath the highest part of the roof, is called the *nave*. Usually on either side of the nave are *aisles*, separated from it by columns. The portion projecting beyond the transept is called the *apse*. In cathedrals of Latin origin the apse is semicircular. In those of Byzantine origin, such as Saint Mark's at Venice, the apse is polygonal. The apse ordinarily faces the east, and is the part containing the choir stalls and altar. Some of the most notable German cathedrals have both an east and a west apse.

[The distinctive features of the Gothic cathedral are described in the article ARCHITECTURE (Gothic, the Expression of a New Life).]

Dimensions of Famous Cathedrals. The following table gives the comparative sizes of the best-known cathedrals:

CATHEDRAL	AREA SQ. FT.	HEIGHT OF TOWERS, SPIRES, OR DOMES, FEET	HEIGHT INTERIOR, FEET	LENGTH EXTERIOR, FEET
Saint Peter's, Rome (not a cathedral, in the true sense)	227,069	448	150	718
Seville, Spain	128,570	400	150	430
St. John the Divine, New York	109,082	400	124	601
Duomo, Milan	107,000	355	153	500
Liverpool, England	101,000	308	116	610
Cologne, Germany	91,464	512	145	511
Amiens, France	71,208	361	140	521
SS. Peter and Paul, Washington, D. C.	70,000	275	95	525
*St. Sophia, Constantinople	70,000	185	184	350
Chartres, France	68,200	378	122	507
Notre Dame, Paris	64,108	204	110	390
York, England	63,800	198	99	486
Saint Paul's, London	59,700	163	80	460
Saint Patrick's, New York	57,768	339	112	332
Winchester, England	53,480		78	556
Rheims, France	48,985	270	124	483
Westminster Abbey, London	40,000	225	101	511

* Since 1923 called Mehmedie Mosque (Mosque of Mahomet).

CATHER, *ka' thur*, WILLA SIBERT (1876-), an American novelist who became widely known through a series of stories dealing realistically with Scandinavian life in the Middle West. Though her later novels introduced different themes and characters, her work always revealed a keen, artistic mind, sincerity, and ability to write simply and directly of real things.

Miss Cather was born at Winchester, Va., and was educated at the University of Nebraska, graduating in 1895. She was on the staff of the *Pittsburgh Daily Leader* from 1897 to 1901, and from 1906 to 1912 was associate editor of *McClure's Magazine*. She began writing books in 1903.



WILLA CATHER

Her Works. Miss Cather's most important books are *The Troll Garden* (poetry), *Alexander's Bridge*, *O Pioneers*, *The Bohemian Girl*, *The Song of the Lark*, *My Antonia*, *Youth and the Bright Medusa*, *One of Ours* (a Pulitzer prize novel), *A Lost Lady*, *The Professor's House*, *My Mortal Enemy*, and *Death Comes for the Archbishop*.

CATHERINE, a variant of *Catharine* (which see).

CATHODE, *kath' ode*. See **ELECTROLYSIS**; **ELECTRODE**.

CATHODE RAYS, the name given to an invisible radiation emitted from the negative electrode (cathode) of a glass tube or other vessel from which most of the air has been exhausted, and into the opposite ends of which metal electrodes have been sealed. Tubes of this nature are called *Crookes tubes* (which see). The rays can be produced by connecting the electrodes with an induction coil or other source of electric energy. Cathode rays cause the formation of a yellowish-green fluorescence wherever they strike the glass of the tube; when they are focused on a piece of platinum the metal becomes red-hot; a boldly defined shadow is produced in the fluorescence on the end of the tube when the metal is placed in their path. While experimenting with Crookes tubes, Roentgen discovered another type of radiation which he called X-rays. These are produced by the impact of cathode rays on a platinum target (see **ROENTGEN RAYS**).

It is now known that cathode rays are streams of negative units of electricity (electrons) shot off from the surface of the cathode at high velocities. They are identical with the beta rays emitted by radium and other radioactive elements (see **RADIOACTIVITY**). H.S.E.

CATHOLIC UNIVERSITY OF AMERICA, located at Washington, D. C., the highest educational institution in the United States under the direction of the Roman Catholic Church. It was founded for the purpose of giving Roman Catholics an opportunity to study higher courses under the guidance of their own Church. The founding of such an institution was advocated by Archbishop John Spalding for several years before Pope Leo XIII granted the constitution in the year 1887. The department of theology began its first sessions in 1889, and other departments were added as the buildings were completed. The attendance is about 400.

CATILINE, *kat' i line* (108-62 B.C.), the celebrated leader of a band of Roman conspirators, whose plots against the republic were discovered and thwarted by Cicero. Catiline was of patrician birth; his full name was **LUCIUS SERGIUS CATILINA**. In his youth, he joined the party of Sulla, and revealed himself as a cruel and greedy supporter of that dictator. Possessed of great physical strength and a lawless nature, with unscrupulous daring and inordinate ambition, it was natural that he should attempt to secure political prominence. He rose to the post of quaestor in 77 B.C., praetor in 68 B.C., and governor of Africa the following year.

On his return to Rome in 66 B.C., he planned to gain the consulship, but was impeached for misgoverning his province and was thus disqualified. Disappointed in his hopes and burdened with debts, he plotted with several other dissolute young nobles to murder the chief men of the state and to seize the power for themselves. At this time Cicero, the great orator, was consul. Having learned of the conspiracy, he placed the city in a state of defense, and in the Senate chamber, with Catiline himself present, exposed the whole affair in his famous *First Oration against Catiline*. The guilty leader, stunned by the eloquence of the consul, attempted a feeble reply, and then fled from the chamber, with cries of "traitor" and "parricide" ringing in his ears.

He escaped from Rome during the night and hurried to his camp in Etruria. Many of his followers deserted when they heard the news of the suppression of the conspiracy and of the execution of the leaders who had remained in Rome. In 62 B.C., Catiline's force was defeated near Pistoria in Etruria, by a Roman army under Antonius, and he himself was slain while fighting with desperate courage.

Related Subjects. The story of Catiline will be considerably extended by reference to the following titles:

Cicero	Praetor	Rome (History)
Consul	Quaestor	Sulla

CATION, *kat' i on*. See **ION**.

CATKIN, a scaly, tail-like flower cluster, or spike, consisting of numerous tiny blossoms, all pistillate or all staminate (see **BOTANY**). Small, flat, modified leaves cover the flowers, protecting them until pollination time. The leaves on the catkin of the "pussy" willow, so silky and grayish-white, give the spike the appearance of a kitten's tail. Catkins on the

America and Europe. It grows erect, to a height of two or three feet, and bears rose-tinged, whitish flowers, and downy, heart-shaped leaves, green above and whitish below. B.M.D.

Scientific Name. Catnip belongs to the family *Menthaceae* (or *Labiatae*). Its botanical name is *Nepeta cataria*.

CATO, *ka' toh*, in ancient history, the name of an honored Roman family, two members of which rose to fame. One of these was a type of the primitive Roman of the early republic; the other died for his principles in the declining days of the republic.

Marcus Porcius (234-149 B.C.), surnamed **THE ELDER**, **THE WISE**, and **THE CENSOR**, was the son of a peasant farmer of Latium. His life on the small estate which he inherited from his father and diligently cultivated taught him to revere the simple manners and customs of his Roman forefathers, and this was the keynote of his character. At the age of seventeen, he fought under Fabius Maximus in the Second Punic War, and took part in the crushing defeat of the Carthaginians at Zama, in 202 B.C. Meanwhile, he had removed to Rome, where he advanced rapidly in rank, serving as quaestor and praetor, and in 195 B.C. gained the consulship.

Cato came prominently into public life at a time when Rome was being influenced by Greek ideas and customs, and throughout his entire career he was an unflinching and uncompromising foe of these, which he believed were a corrupting element in the state. In 184 B.C. he was elected censor, and so severe and unsparing was he in the performance of his duties that the title "Cato the Censor" became his mark of distinction, and has been borne by him through all the centuries of history.

Cato was sent to Carthage in 157 B.C. on a mission for the state. Impressed by the prosperity of that city, he returned home to warn his countrymen that Rome had still a dangerous rival, and thereafter he concluded every speech with the famous exhortation, "Carthage must be destroyed." In the year of his death, the great city was razed to the ground by Roman might. Cato was equally great as a writer and as a statesman, and he was the first important author who wrote Latin prose. Of his many works, only one, a treatise on agriculture, has survived.

Marcus Porcius (95-40 B.C.) is known in history as **CATO OF UTICA**, from the place of his death, to distinguish him from his great-grandfather, Cato the Censor. He fought with distinction in the war against Spartacus, the gladiator, served as military tribune in Macedonia, and was made quaestor in 65 B.C. In the latter office, he was generally commended for the reforms he introduced in the management of the public treasury, and was chosen tribune of the people in 63 B.C. As tribune, he delivered a speech accusing Caesar of having had a share in Catiline's plot.

Cato's opposition to Caesar was due to his inability to see that the declining state needed the service of such a genius as the great Roman leader. He placed himself on the side of Pompey when the latter broke with Caesar, and as soon as the news of Pompey's defeat at Pharsalia reached him, he departed to North Africa. There he was placed in command of the defense of Utica, but, convinced that the cause of the



CATKINS

- (a) Willow (c) Quaking asp
(b) Seaside alder (d) American white birch

shade-tree willow are usually yellow, and they appear before or with the leaves. The drooping catkins of the poplar, the bright-yellow early spring catkins of the birch, the sweet, heavy fragrance from those of the chestnut are all familiar to the lover of trees. Ament is another name for catkin. B.M.D.

CATMINT, a variant of catnip (which see).

CATNIP, OR **CATMINT**, a plant of the mint family, so named because of its peculiar effect on cats. They love to roll in and play with the leaves, which they also greedily eat. Formerly cultivated in gardens for seasoning and medicinal purposes (catnip tea was once a valued home tonic and remedy for infants' colic), the plant has become a common roadside weed in North



Photo. St. Clair

CATNIP

Leaves and flowers.

republic was hopeless and preferring death to surrender, he took his own life with the sword.

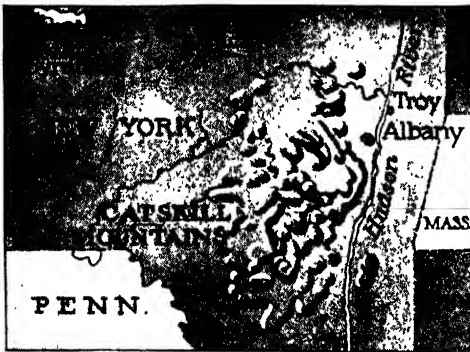
Related Topics. A broader knowledge of the life and times of these men will be gained from the following articles:

Caesar, Caius Julius	Praetor
Catiline	Punic Wars
Carthage	Quaestor
Censor	Rome (History)
Consul	Spartacus
Pompey	Tribune

CATS, JAKOB. See NETHERLANDS, THE (Language and Culture).

CATSKILL AQUEDUCT. See AQUEDUCT; CATSKILL MOUNTAINS; NEW YORK (city).

CATSKILL MOUNTAINS, a rugged and beautiful range of low mountains lying west of, and nearly parallel to, the Hudson River in New York state, the southern end of the range being about 100 miles by rail from New York City. The rock formation shows that these mountains were once a river plateau, but the



LOCATION MAP

rains and frosts, and probably glaciers, have carved these rocks of the ancient sea into many interesting shapes. And now, covered with trees and woodland plants and flowers, with waterfalls and little rivers here and there, they furnish ideal spots for a large number of summer resorts and sanitariums. This wild, interesting scenery is reached by three routes, the views from each approach being well worth a long journey. The Catskills are fifty miles long and thirty miles wide, the two highest peaks being Slide Mountain, 4,250 feet, and Hunter Mountain, 4,025 feet. Beginning in these mountains is the ninety-two-mile Catskill Aqueduct, which furnishes much of the water supply of the city of New York. Here, too, is the Dunderberg, the scene of Washington Irving's *Rip Van Winkle*, a delightful piece of fiction of the days of King George the Third. See GEOLOGY (Mountains and Plateaus); NEW YORK (Physical Features).

CATSUP. See KETCHUP. The word is also a variant of *catchup*.

CATT, CARRIE CHAPMAN (1859-), one of the most zealous and successful of the Amer-

ican leaders in the movement for woman suffrage. She was born at Ripon, Wis., and educated in the State Industrial College of Iowa, later studying law. In 1884 she married Leo Chapman, and in 1890, four years after Mr. Chapman's death, she became the wife of George W. Catt, a civil engineer, who died in 1905.

Mrs. Catt taught school and advanced to the position of superintendent of schools in Mason City, Ia., before she decided to devote all of her talents and energy to the equal-suffrage cause. In 1890 she became state lecturer and organizer of the



Photo Clineinat

CARRIE CHAPMAN CATT



Photo St. Clair

CAT-TAILS

suffrage movement in Iowa, and in the years following lectured in nearly every state in the Union and in Canada and almost every country of Europe. She also served as president of the National American Woman Suffrage Association and of the International Woman Suffrage Alliance. To Mrs. Catt was due a large part of the credit for the success of the suffrage movement in America. See WOMAN SUFFRAGE; ANTHONY, SUSAN B.

CAT-TAIL, a wild plant of the swamps and marshes, useful and decorative. There are two species found throughout the United States and Southern Canada. Sometimes only a few plants are found in one spot; in other places, acres of marsh are covered with their waving green leaves and handsome, seal-brown top growth of dense, pollenlike material and oval spikes of flowers. And here, daintily perched at the tip-top point of a flower stalk, we will find the little marsh wren, singing its song, or from the hidden nests in the lower leaves hear the chatter of bittern, rails, and grebes. The larger cat-tails, or *bulrushes*, as they are sometimes called, grow to a height

of five or six feet, have long, broad leaves, and the yellow male flowers directly above the brown female ones. The smaller cat-tails have narrow leaves, and the male and female flowers are divided by a short space of bare stalk.

The roots of cat-tails are rich in starch and are eaten by the Cossacks of Russia. In England, too, they are eaten under the name of *Cossack asparagus*. The silky down of cat-tails is used in dressing wounds and for upholstery. During the World War, it was employed in the manufacture of artificial silk and was a substitute for cotton. The pollen of these plants is very inflammable, and in some places in Europe and India is used as tinder. Soaked in kerosene, the cat-tail serves the small boy as a torch on a festive occasion. See illustration, page 1249. G.M.S.

Scientific Names. The cat-tails belong to the family *Typhaceae*. The larger species is *Typha latifolia*; the smaller, *T. angustifolia*.

CATTALO, *kat' a lo*. See BUFFALO.

CATTEGAT, *kat' e gat*, former spelling of Kattegat (which see).



CATTLE, *kat' 'l*. When we consider how many useful products we derive from cattle, and how much they contribute to our comfort and welfare, we realize that they are the most valuable of domesticated animals. Beef in its many forms, milk and cream, cheese and butter are indispensable foods we owe to cattle; their hides provide leather, and their hoofs, horns, bones, and sinews are made into a wide variety of useful commodities, including glue, buttons, ornaments, fertilizer, and many others. We are accustomed now to restrict the name cattle to oxen, to the familiar beef and dairy animals of our farms and ranches, and to the zebu, the humped cattle of India, but centuries ago any domesticated animal—the hog, horse, sheep, or goat—was included among the species known as cattle; the word comes from the same root as *capital* and *chattel*.

From the standpoint of zoölogy, cattle are closely related to the American buffalo or bison, the water buffalo of Africa and Asia, and the smaller carabao of the Philippine Islands. There were no cattle in North America when the continent

was first explored by white men. The early settlers brought oxen, steers, and cows with them from Europe, herds were established, and the foundations were laid for the prosperous cattle industry that contributes so much to the agricultural wealth of the United States and Canada.

The ancestors of European cattle were wild, fierce creatures whose general appearance is known from bones excavated by archaeologists. In very early times, these animals were hunted for their meat; later, man trained cattle to draw his plow, and still later, he bred them for their flesh and milk. The fine specimens of pure-bred animals of to-day are really a modern product, for the greatest progress in this field has been made since the beginning of the nineteenth century. The lines of descent from the prehistoric species are not clearly marked, and the origin of most of the modern breeds is rather obscure. We do know, however, that cattle were among the first animals to be domesticated, and Bible references show that they have been man's faithful servants for thousands of years.



The Familiar Breeds. The common breeds are the Holstein-Friesian, Guernsey, Jersey, Ayrshire, Brown Swiss, Dutch Belted, Kerry, Dexter, French Canadian, Shorthorn, Hereford, Aberdeen-Angus, Galloway, Red Polled, and Devon. Below will be shown the classification of these fifteen breeds into types according to the greatest usefulness. The breeds are distinguished one from another mainly through color differences, horned characteristics, and differences in type. The horned characteristics may be discussed here, and the type and colors left until the individual breeds are described.

With the exception of the Aberdeen-Angus, Galloway, and Red Polled breeds, cattle are horned. The horns of the various breeds vary all the way from the short, blunt horns, about twelve inches long, of the Shorthorns and Herefords, that stick straight out from the sides of the head, to the long, beautiful, up-curving horns of the Ayrshires. At one time the native cattle of Texas were characterized by long horns which were so widespread that the name *Texas longhorn* came into use. The horns on some of these cattle were ten feet from tip to tip. These were inferior range cattle which quickly gave way to better types, because of the introduction of superior beef stock. A few of these longhorns are still found in Mexico and other parts of Southern North America, and they are plentiful in South America.

Hornless Breeds. Breeds like the Aberdeen-Angus and Galloway are said to be *polled*, or without horns, though occasionally cows and bulls appear without horns in all breeds. This has led to the development of polled strains within the Jersey, Holstein-Friesian, Shorthorn, and Hereford breeds. Herds of cattle naturally polled, or those that have been artificially dehorned, are much quieter and may be herded together like sheep. This practice of artificially dehorning cattle has become more and more common because cattle kept quiet are easier to handle and yield more milk or lay on fat more quickly.

Dehorning Cattle. Cattle may be dehorned in two ways. The most humane way and the easiest way is to prevent the growth of horns on young calves, and this should be done before the calves are a week old. The hair over the small buttons is clipped close, and on the skin around them vaseline or lard is rubbed. The little horn button is then rubbed with a stick of caustic potash which has been moistened in water. The horn must be rubbed hard until blood appears, so that every vestige of the horn is destroyed, for if all of the young horn tissue is not destroyed, small, unsightly, misshapen nubs of horns will grow. Two precautions must be taken; the potash should be wrapped in dry paper where it is held in the

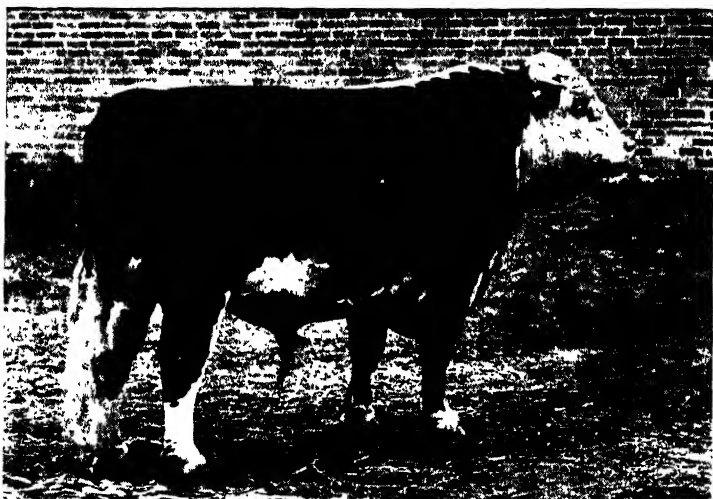
fingers, so that the skin may not be injured, and one should be careful that none of the liquid runs down into the eyes of the calf, because blindness would ensue. Horn tissue is harder than skin tissue, and anything which would destroy the horn would destroy any skin tissue or tissues of similar nature with which it might come in contact. Cattle thus dehorned while young will have much more slightly heads than those from which the horns have been clipped when older.

The second way of dehorning applies to older animals, and consists merely of clipping off the horns close to the head with suitable clippers, or of sawing them off. This method is very painful to the animal, but is humane in that it makes the animals more docile and less dangerous to others of their own kind and to human beings. An important precaution to be observed in this second method is to make sure that the horns are clipped enough so that no future growth may take place. While the wounds are healing, keep the animals away from hay or straw stacks.

Two Types of Cattle. Cattle are bred primarily for meat and for milk. This has led to more or less clearly defined forms of animals for these purposes. Those which have been bred for great production of milk, cheese, and butter are said to be the *dairy type*; those which produce barely enough milk for the support of their young and which are of a bodily form to yield a large amount of the highest-priced cuts of meat, are classed as the *beef type*. Between the two there is a type known as the *dual-purpose type*.

The Dairy Type. The dairy type of animal is characterized by a general outline of body that is "wedge-shaped from before backwards." This is brought about by a large, full udder, a large abdomen, and by the fact that in the dairy cow the hips and pelvic arch are usually somewhat higher than the shoulders and withers. The dairy cow is spare in form, with no superfluous flesh. Her joints are prominent, and her general form shows a looseness and openness not to be found in the beef animal.

A dairy cow reaches full growth at about five years of age. It is best to breed her when she is fifteen to eighteen months old, so her first calf will be born before she is twenty-seven months old. Her average useful life extends over a period of about five years; that is, she will not calve on the average beyond eight years, although individual cows sometimes continue to produce until twelve or fourteen years of age. A cow should produce a calf every twelve months. She should be milked about ten and one-half months out of every twelve and be allowed to rest about six weeks previous to the birth of the next calf. During this resting period, she should be well fed, so that she may store up fat and energy for use in her



next productive period. The time following the birth of the calf, when a cow is milking, is known as the *lactation period*.

Cows should be milked twice a day, as a rule. When an individual yields more than forty pounds, which is about twenty quarts, it may be best to milk her three times a day. A cow which is inclined to be docile and turn most of her food into milk, showing no tendency to lay on fat, is said to have a good "dairy temperament." This does not mean a sluggish temperament; she must be bright and full of nervous force and energy, but must be quiet.

The important dairy breeds are the Holstein-Friesian, the Guernsey, the Jersey, and the Ayrshire. The Holstein-Friesian breed originated in Holland, where the natural conservatism of the Dutch people has caused them to prefer this one breed of cattle for upward of 2,000 years. This breed has found greatest development in the United States.

The Guernsey and Jersey breeds do not produce so great a quantity of milk, but make up for less quantity by a greater content of butter fat. The Guernsey and Jersey have been purely bred for over 200 years on the islands of the same names in the English Channel, off the coast of France.

The Ayrshire breed, which originated in County Ayr, Scotland, is of about the same size as the Jersey, but is of a more closely knit, compact type. These animals

Herefords. Bull Cow
Steer

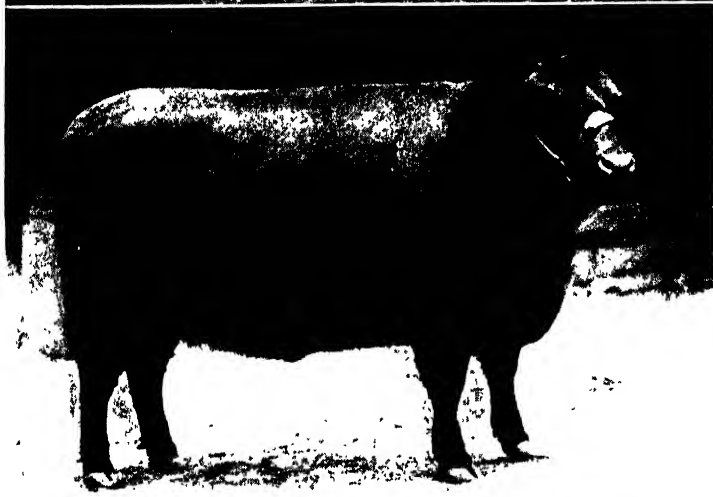
produce a good quantity of milk of excellent quality, and have a reputation as better grazers than the other breeds.

Holstein-Friesian cattle are black and white. The color of the Jersey in general is solid fawn, varying through all the shades from light to dark. White is allowable and may occur in well-defined patches. The Guernsey cow is generally larger than the Jersey, and perhaps a little coarser. The color is yellowish, brownish, or reddish-fawn. This is wholly unlike the fawn of the Jersey, and is not likely to be mistaken after a few individuals of each of the two breeds have been seen. White markings are more common with Guernseys than with Jerseys. Ayrshire cattle are red and white, although occasionally a brown-and-white animal may appear.

Mature Holstein-Friesian cows should weigh 1,100 to 1,800 pounds. They yield the most milk of any of the dairy breeds; a good average yield for a mature Holstein-Friesian cow would be thirty pounds of milk a day for 300 days, or 9,000 pounds of milk in one year, and this milk will test about 3.5 per cent butter fat. A mature Guernsey cow should weigh 1,000 pounds and yield 6,000 pounds of milk in one year, testing 4.8 to 5.0 per cent butter fat. A mature Jersey cow will weigh from 700 to 900 pounds, and will produce in one year 5,000 to 6,000 pounds of milk, testing 4.5 to 5.5 per cent of butter fat. A mature Ayrshire cow will weigh



Shorthorns. Bull Cow
Steer



about 1,000 pounds, and will produce 6,000 to 7,000 pounds of milk, testing 3.8 to 4.0 per cent butter fat.

Brown Swiss, Dutch Belted, Kerry, Dexter, and French Canadian are minor breeds of cattle classed as dairy breeds.

Care and Feeding of Dairy Cattle. The foods used in feeding dairy cattle are divided into two classes: *coarse foods*, or *roughage*, and *concentrates*. Examples of coarse foods are alfalfa, clover hay, corn fodder, and corn silage. The concentrates, those foods containing a high percentage of digestible matter, ordinarily used in feeding, are divided into three groups, according to the amount of protein that they contain. Protein is the chemical compound in the food from which are built the hair, hoofs, horns, and lean meat of animals. The casein, or curd, of milk is nearly pure protein. The protein in the milk and the other protein materials in the body cannot be built from anything except the protein in the foods; therefore the importance of the protein.

If good foods are used, with plenty of protein in them, the feeding will be good. There are three protein food groups. The *low protein group* contains corn, oats, wheat, rye, barley, buckwheat, hominy chop, dried beet pulp, and corn and cob meal. The grains, corn, oats, etc., all should be ground for dairy cows. These contain less than twelve per cent of protein in their total. The *medium protein group*, between twelve per cent and

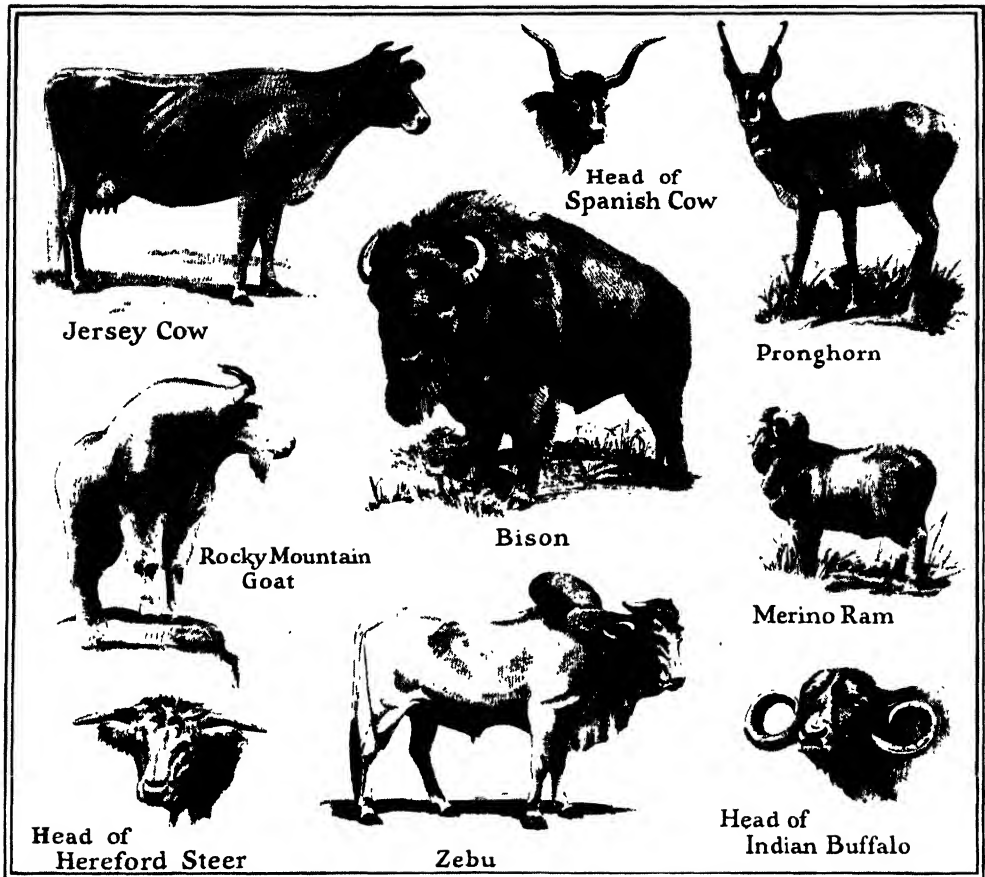
Beef Types. Angus bull. Angus cow. Galloway cow.

twenty-five per cent, contains wheat bran, mixed wheat feed, standard-wheat middlings, flour wheat middlings, buck-wheat feed, pea meal, cull beans, and some others. The *high protein group*, twenty-five per cent and over, is made up of malt sprouts, linseed-oil meal, cottonseed meal, gluten feed, brewers' dried grains, distillers' dried grains, buck-wheat middlings, and a few others. In order thoroughly to understand the feeding of animals, one must be familiar with all of these feeds and their relative values.

The food that an animal eats in twenty-four hours is called a *ration*. With all the clover hay and corn silage that she will eat, or the equivalent amount of other coarse foods, it would be good practice to feed a cow a mixture of equal parts of three concentrates, choosing one from each group noted above. This is a simple and effective way of combining foods into a ration. For example, an efficient ration might be clover hay, corn silage, and a grain mixture of corn meal, wheat bran, and cottonseed meal, equal parts by weight. Feed her one pound of the grain mixture to three or three and a half pounds of milk yielded daily; one of the foods in the grain mixture should be a bulky food, like wheat bran. The combinations of grains that should be used will depend on the relative prices of the concentrates available. Corn silage, roots, or some



Dairy Types. Three-year-old Holstein. Jersey type. Guernsey



SOME MEMBERS OF THE OX FAMILY

such succulent food should always be provided. Three or more concentrates should always be used in the grain mixture.

In addition to being well and generously fed, dairy cattle must always be provided with a comfortable, light, well-ventilated stable, with well-bedded stalls. The feeder must see that his animals have access to a clean supply of fresh water twice a day, and salt should be fed to the extent of one ounce a day. The cows may have this salt mixed with their grain every day, or receive the equivalent amount twice a week.

Young stock, bulls, and cows not giving milk may be fed good coarse foods and enough of the following mixture of concentrates to keep them growing well: equal parts by weight of wheat bran, ground oats, and corn meal, with ten pounds of oil meal mixed with every hundred pounds of the other three foods.

Calves intended for the dairy herd should be taught to drink when two or three days old, but during these days a calf should be left with its mother. Then it should be separated

from the mother and put in a clean, well-bedded pen by itself. To teach it to drink, use a small pail into which it can easily get its head. Put about two quarts of warm milk fresh from the cow into the pail, back the calf up into the corner of the pen and straddle its neck. Hold the pail in the left hand, and with the right hand hold its nose down into the milk with two fingers slightly into its mouth. Hold these two fingers a little apart so that the milk will be drawn in between them. Gradually withdraw the fingers. After a few attempts the calf will usually drink properly as soon as it gets a good taste of the milk. It should get whole milk for a week or ten days, and then should gradually be turned to skimmed milk. Change from the whole milk to the skimmed milk at the rate of one pound per day, and increase the amount of skimmed milk as the appetite of the calf demands it. Milk should always be fed at a temperature of 90° to 100°.

The greatest trouble in feeding calves comes from cold milk, dirty pails, and cold, dirty pens.

No one should ever feed a calf out of a pail he would not be willing to drink out of himself. As soon as the calf will eat good clover hay, it should receive all it will eat. A good grain mixture is the one indicated above for bulls and young stock. The main thing of importance in caring for young animals at all times is to keep them growing well.

The Beef Type. The beef type is characterized by a form of body of the shape of a parallelogram when viewed from the side. The animal is closely knit, with a small, fine bone, heavily and evenly fleshed all over, in direct contrast to the openness of frame and angular characteristics of the dairy type.

The best-known beef breeds are the Shorthorn, the Hereford, the Aberdeen-Angus, and the Galloway. The Shorthorn breed, formerly called *Durham*, originated in Northeast England, in the counties of Durham and York, and has attained great prominence as a beef breed. The Herefords originated in County Hereford, in Southwest England, but have not been as uniform in their development, lacking, as a breed, in the hindquarters. The Aberdeen-Angus and Galloway breeds have not attained so great prominence as the other breeds, but are both good for beef production.

Shorthorn cattle are red, red and white, pure white, or a mingling of red and white called *roan*. Hereford cattle are red, with a white face, white legs below the knees, white breast, white brush, white on the top of the neck, and white along the bottom of the abdomen. Aberdeen-Angus and the Galloway cattle are black and are polled. Galloway cattle have longer hair than the other breeds, and their hides when tanned with the hair on make the best overcoats and robes.

Feeding Beef Cattle. In growing and feeding beef cattle, two systems are in general practice: (1) Through the grain-growing regions, the cattle are bred and fattened on the same farm; (2) the cattle are bred and grown for a year or two on the range and then shipped into the grain-growing country to be fattened and finished for market. In the first of these systems, the animals to-day are grown on mother's milk and the best of corn, just as rapidly as possible. When they are marketed at six to eight months of age by this method, they are called *baby beefs*; they are sold at

a live weight of 450 to 500 pounds and bring the highest prices on the market. Good alfalfa or clover hay, with plenty of corn and some

oil meal after the calves have been weaned, is the typical ration in producing this kind of meat. On farms where baby-beef-raising is not practiced, the cattle are kept growing well with good hay (clover hay, mostly), corn, and a little of some concentrate such as cottonseed meal, gluten food, or oil meal, to provide more protein than

is found in a strictly corn-and-hay ration.

In modern farm beef-raising, the cattle are turned to market at a weight of from 1,000 to 1,200 pounds at about two years of age. Formerly beefs were kept on roughage with very little grain until three years old, when they were fattened and turned to market at about 2,000 pounds live weight. It is now considered more economical to keep the animals growing and market them not later than at two years of age. For example, a popular method, assuming that the calves are born in the spring, gives them milk and pasture the first summer, a light grain ration the first winter, pasture the second summer, a light grain ration the second winter; then they are put on a heavy grain ration with pasture the third summer. This finishes them for the fall market, and this method utilizes pastures and roughage to the greatest advantage; the method is modified to fit the conditions on the individual farm and to fit the market, and the animal reaches the market when a few months over two years old.

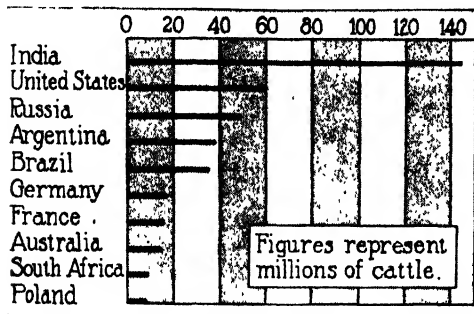
The beef-breeding cows reach about the same age as the dairy cows. The cow is considered to have passed a useful life if she has produced five calves. The cows are kept as long as they will breed regularly, and are then sold for what they will bring.

The Great Cattle Ranges. There is a part of the country through the western part of North and South America, adjoining and including the mountain ranges, which is low-priced and generally unfit for farm purposes. This is partly due to the nature of the country, but mostly to the lack of rainfall. However, these lands produce nutritious grasses, which are available to animals that can travel over relatively long distances for water and sparse vegetation. This range country lent itself to the breeding and rearing of cattle and thus devel-



YOUNG MEMBER OF A 4-H CALF CLUB

oped the great cattle ranches. Here the yearly cost of feeding a steer is small; therefore animals are usually kept until two or three years



old and then shipped to be finished on farms. The range develops the frames, but the animals are sold as feeders relatively thin in flesh. Some farmers prefer two-year-old feeders weighing 1,100 pounds, because of the greater *spread*. By spread is meant the increase per pound that the finished steer sells for over the cost per pound of the feeder. Thus, if an 1,100-pound feeder were sold at an increase of \$1.50 per hundredweight over the purchase price, there would be a gain of \$16.50, whereas the gain on the original weight of an 800-pound feeder would only be \$12. Thus it might be more advantageous to fatten the larger animal, even though it cost more per pound of gain.

The great cattle ranges of Western North America are being rapidly given over to sheep ranching and to grain farming. The beef business is becoming more a small-farm business instead of a great cattle-ranch business.

Something of the same type of cattle-raising has developed on range land in other countries, particularly in Argentina, South Amer-

kets. The United States is no longer exporting beef; there is not a sufficient amount in America, and the supply for home consumption must be augmented from other countries. The effect of the shipment of beef from Argentina to the United States will be to keep the prices of meat lower to the consumer, and of course the farmer in the United States will lose where the city consumer will gain. The importation of meats from Argentina into the United States has increased rapidly since 1910, but not much more rapidly than to the western countries of Europe. W.N.H.

Loss of Cud. The cud is food brought up from the first stomach of such ruminants as cattle, for a second chewing. This chewing of the cud is a natural process, carried on involuntarily when the animal is well. When the animal is sick, the process ceases. Loss of cud, therefore, is not itself a disease, but is a symptom of illness, usually of digestive disturbance. When it occurs, an attempt to find the disease and its cause, and to relieve suffering, should be made at once. Food is frequently withheld for twenty-four hours, but water is given freely.

Classification. Beef and dairy cattle, oxen, water buffaloes, zebus, and the American buffalo, or bison, form the genus *Bos* in the subfamily *Bovinae*, of the family *Bovidae*. To this family belong such other hollow-horned cud-chewers (ruminants) as sheep, goats, and antelopes. The scientific name of European cattle is *Bos taurus*; the zebu is *Bos indicus*.

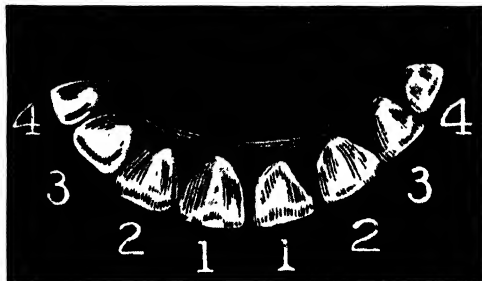
Related Subjects. The following articles will be found to contain much additional information which will be of interest to readers of this article:

Beef	Horn
Butter	Meat and Meat Packing
Buttermilk	Milk
Cheese	Ruminants
Cow	Zebu
Dairying	

CATTLE PLAGUE. See RINDERPEST.

CATTLE TICK, also called the TEXAS FEVER TICK, is a common pest of cattle in the Southern United States, and the sole means for the transmission of the disease known as Texas fever. This tick has long been the greatest obstacle to the establishment of the livestock industry in the Southern states. The Texas fever is caused by a minute protozoan animal of the same general group as the parasite causing malaria. It passes from the body of the infected female tick into the eggs, so that all her progeny are infected. Since the disease is not transmitted except by ticks, to stamp out the disease it is only necessary to destroy the ticks.

The fully grown adult tick may be as much as a half-inch long, thick-bodied, and oval in shape. The adult female becomes engorged with blood and eggs, and drops from the animal to the ground. The female tick may deposit as many as 3,000 eggs; after several weeks these hatch, and the young ticks crawl onto grass or weeds, and attach themselves to cattle. If no cattle are present, the young tick



AGE OF CATTLE

The age may be told as follows: The teeth marked 1 appear when the animal is eighteen months old; those marked 2, at the age of twenty-seven months; those marked 3, at the age of three years, and those marked 4 at three years nine months.

ica With the increase in price of meat in the world's markets and the better methods of refrigeration, Argentine beef is being sold in the English, United States, and Canadian mar-

dies after three or four months. If the tick succeeds in finding a host, it may infect the animal with Texas fever.

The United States Department of Agriculture developed a method of eradicating ticks by dipping the cattle and moving them to tick-free pasture. In 1906 the tick-infested area of the Southern states was placed under quarantine, and the movement of cattle permitted only when free of ticks. Since that time the ticks have been practically eradicated from the entire South, and the quarantine has been lifted, except in a few localities. The extermination of the cattle tick and the Texas fever is considered the greatest single achievement of the department since its establishment.

W.J.S.

Classification. The scientific name of the cattle tick is *Margaropus annulatus*. It belongs to the family *Ixodidae*.

CATULLUS, *ka tul' us*, CAIUS VALERIUS (about 87—about 54 B.C.), a famous Roman lyric poet, whose verses are remarkable expressions of his personal feelings and experiences. He formed a deep attachment for a woman who appears in numberless poems, under the name of Lesbia, and his love for her was the theme of some of his finest lyrics. His joys and sorrows, his despair when he found Lesbia unfaithful to him, his affection for his friends and hatred for his enemies are all expressed in his writings without the slightest restraint.

Among the longer works of Catullus, the most remarkable are his *Nuptials of Peleus and Thetis*; his two marriage poems, forerunners of the marriage songs of Spenser, Jonson, and Herrick; and a weird poem, *Attis*, which suggests an Oriental influence and is unlike anything else in Roman literature.

From His Works. The following translation of a passage in one of his songs is suggestive of his imagination:

Suns may set and rise; we, when our short day has closed, must sleep on during one eternal night.

Catullus was a master of epigram, and he used numerous expressions like the following:

What woman says to fond lover should be written on air or the swift water.

CAUCASIA, *kaw ka' shah*, a region in the southeast of the former Russian Empire, divided into two portions by the Caucasus Mountains, which extend from the Black Sea to the Caspian Sea. The portion to the north of the mountains is called Cis-Caucasia, or *on this side of the mountains*; that to the south, Trans-Caucasia, or *across the mountains*. After Russia's collapse in 1918, the southern section deserted the mother country, and from it were organized the new republics of Georgia, Armenia, and Azerbaijan, which in 1921 became the Transcaucasian Socialist Soviet

Republic of the U. S. S. R. Caucasia is rich in natural resources; its oil wells are second in value only to those of the United States. The principal portion of the oil trade is carried on through Baku, on the Caspian, and Batum, on the Black Sea.

The Caucasus Mountains. This system extends from west to east for a distance of about 900 miles and forms a natural barrier between Asia and Europe. The inhabitants of the region have been regarded as typical of the white, or Caucasian, races of the world; hence the name. The mountains are bold and rugged, many peaks being higher than the highest of the Alps, though lacking the scenic effects found in the latter. They are formed principally of granite and schists, the only peaks showing distinct volcanic origin being Elbruz, 18,470 feet above sea level, and Kasbek, 16,546 feet. In the east numerous passes cross the mountains, but the western end of the range is impassable. The lower slopes are covered with forests of oak, birch, fir, ash, beech, and elm, in which are found deer, goats, wolves, lynxes, foxes, and other wild animals, besides numerous birds of prey. The Kuban River drains the western slopes, emptying into the Black Sea.

Related Subjects. The reader is referred in these volumes to the following articles.

Armenia
Azerbaijan
Georgia

Russia
Transcaucasian Socialist
Soviet Republic

CAUCASIAN RACE. See RACES OF MEN.

CAUCASUS, *kaw' ka sus*, **MOUNTAINS.** See CAUCASIA.

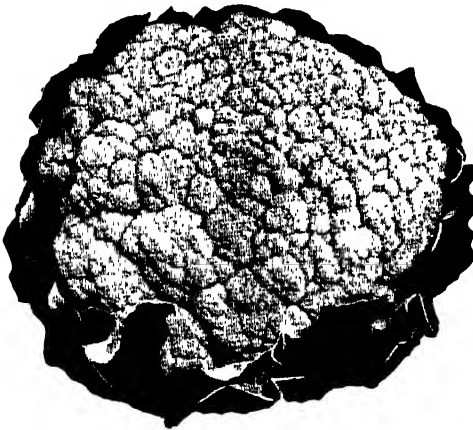
CAUCUS, *kaw' kus*, a meeting of members of a political party, called for the purpose of nominating candidates for office, to decide on a policy, or both. The caucus is the most democratic means of party government, and was the chief feature of the American political system for over a century. In a party caucus all the recognized members of the party were allowed to vote and speak. The voters of a town, a village, a legislative district, or other small governmental unit usually held a caucus, and from these smaller units delegates were sent to a similar caucus or convention of the county or state. Originally, the caucus was an excellent method of party government, but as the population of local units increased, the way opened for abuses and government by bosses. Some other method was seen to be needed, and the local caucus has now been supplanted very largely by the direct primary (which see).

The caucus is still used in legislative bodies, including Congress and many of the Parliaments of the world. In the United States, it has become a recognized feature of party government. The members of a single party in either house of Congress meet in session to

decide on a policy and the party's candidate for Speaker or other officers. The decision of such a party caucus is regarded as binding on all the members of the party, whether they are present or not. Until 1824 the members of each political party in the Congress of the United States held a caucus for the purpose of nominating candidates for President and Vice-President. The people had no voice in naming their President. See ELECTIONAL COLLEGE.

The system of party caucuses greatly simplifies procedure in a legislative body; if a party which has a majority of members can decide on a definite policy, it can outvote the minority without delay. On the other hand, there is always the danger that the minority in a caucus will be overruled, and that the majority of the caucus is really only a minority in the legislative body. Once it was a rare occurrence for any legislator to refuse to abide by the decision of his party caucus, but in more recent days of "insurgents" and shifting political allegiance, resulting in "blocs," the caucus is not always effective in promoting legislation. E.D.F.

CAULIFLOWER, *kaw' li flou ur*, a garden variety of cabbage, which, instead of a bud-like head of leaves, is a very tight head of



CAULIFLOWER

fleshy flowers. More delicately flavored than cabbage, it is highly esteemed as a table vegetable, and is served with cream or butter sauce, or is pickled. The cauliflower requires fertile soil, well drained but moist. To keep the heads white and attractive for market, growers protect them from sun and rain by tying the outer leaves over them. Cauliflower, like cabbage (which see), is a valuable addition to the diet because of its mineral salts and the presence of vitamins (which see). B.M.D.

Scientific Name. The scientific name of cauliflower (and also of cabbage) is *Brassica oleracea*. It belongs to the family *Cruciferae*.

CAULKING. See OAKUM.

CAUSE USED FOR EFFECT. See METONYMY.

CAUSTIC, *kaws' tik*, a name applied to various chemical substances capable of burning or destroying organic tissues. *Caustic soda*, which the housewife calls *lye*, or *soda lye*, when it is dissolved in water, is used to clean greasy sinks and other plumbing. It should be handled very carefully, as it may cause painful sores on the skin. Manufacturers and others use large quantities of caustic soda in the preparation of soap, rayon, and leather, in kerosene refining, in bleaching, and in the dyeing industry. Chemically, it is sodium hydroxide, a base (see BASE ALKALI).

Caustic Potash, called potassium hydroxide by the chemist and *potash lye* by the layman, is an ingredient of soft soap. It was used extensively on farms in the days when soap making was a task of the farmer's wife.

Lunar caustic, or *silver nitrate*, is employed medicinally, and in stick form to cauterize septic wounds. Silver nitrate solution is effective in the prevention of sore eyes of newborn infants. See LUNAR CAUSTIC. W.A.E.

(For caustic in physics, see ABBERRATION)

CAUSTIC POTASH. See POTASSIUM.

CAUSTIC SODA. See SODA; CAUSTIC.

CAVALIERI, *kah vah' lyä' re*, LINA (1874-), an Italian operatic soprano, one of the most beautiful women on the operatic stage. In

private life she is MADAME LUCIEN MURATORE, wife of a well-known operatic tenor (see MURATORE). Cavalieri was born at Rome, and began her career as a singer at cafés and concert halls. Possessed of a determination to advance and equipped with ability, a strong will, and a fighting spirit which recognized no obstacles in her path to success, the obscure Roman



Photo U & U

LINA CAVALIERI

cabaret singer found herself in time an admired and recognized star in the very center of the world of opera. After a brief appearance on the lyric stage, she made her professional début in 1900 as Nedda in *Pagliacci*, at the Royal Theater, Lisbon. Since then she has played principal rôles in a repertory of noted operas, including *La Bohème*, *La Traviata*, *Rigoletto*, *Mignon*, and *Fedora*.

CAVALIERS, *kav a leez'*, meaning *horsemen*, was a name applied during the Civil War in England to the gaily dressed troops devoted to the cause of Charles I, as opposed to Round-



Photo U & U

DECLARED TO BE THE WORLD'S MOST BEAUTIFUL UNDERGROUND PASSAGE

This cavern is near Trieste, not far from the Adriatic Sea, and is twenty-five miles in length. A small railway, which is visible in the illustration, winds its way through the passage, which is dotted with stalagmites and stalactites [Pictures of the interiors of great caverns in the United States are shown elsewhere in these volumes. See Related Subjects, at the end of the article CAVE.]

heads, the name given to the adherents of Cromwell and the Parliamentary cause (see COMMONWEALTH OF ENGLAND). As now more generally used, the name applies to a gay dancing partner or woman's escort. See ROUNDHEADS.

CAVALLERIA RUSTICANA, *kah vahl la-re' ah roo ste kah' nah*. See OPERA (Some of the Famous Operas).

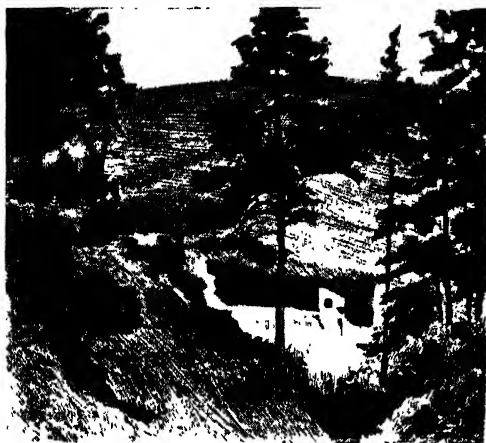
CAVALRY, *kav' al ric*, a body of mounted troops which formed an important branch of all modern armies previous to the World War. In medieval days, armed knights and their esquires were the only mounted men, and battles depended a great deal on their personal prowess. There was no concerted action, and battles developed into a series of individual combats. There came about a gradual change in tactics, and mounted men were organized into troops.

The original form of cavalry was similar to that of mounted infantry. Horses served a good purpose by conveying men quickly to parts of the battlefield where they were needed; when there they dismounted and fought as infantry. It was Cromwell who proved the effectiveness of onslaught by charging cavalry. Napoleon carried the use of cavalry to a high state of perfection and developed the finest cavalry leaders the world had ever known.

Modern cavalry regiments are armed with swords or sabers, and carbines and pistols, or with lances. The conditions of fighting, however, have greatly changed, and spectacular cavalry charges are almost things of the past.

The Cossacks of Russia formed the most terrible cavalry regiments of Europe under the old system of fighting, and they sustained their centuries-old reputation as valiant warriors in the World War, at the beginning of the conflict. In the same gigantic struggle, the Uhlans of the German army, armed with their long, sharp-pointed poles, were fully as dauntless and brave, but the effectiveness of cavalry ended with the adoption of trench fighting and machine gunnery.

CAVE, OR CAVERN, a large cavity in rock, formed in some manner by the removal of the rock material. Most caves are in limestone, and are formed through solution by water trickling through crevices in the rock. Some caves are fashioned in a similar manner in other kinds of rock, and some are formed through wear by streams flowing in fissures. Sea caves are worn in the bases of cliffs where waves beat against them. Caves are formed in lava flows, where the surface cools and hardens enough to support itself if the still molten portion of the lava flows out from



CAVE DWELLINGS IN MEXICO

These were similar in many respects to the cliff-dwellings of another period.

beneath it. Ice caves are formed in glaciers and icebergs by irregular melting.

Caves are abundant in limestone regions where the larger streams flow in rather deep valleys. Mammoth Cave in Kentucky is the best-known cavern in America. Among others well known are Howe's Cave in New York, Luray Caverns in Virginia, Wyandotte Cave in Indiana, and Wind Cave in South Dakota. Even more extensive and magnificent is the Carlsbad Cavern in New Mexico, possibly the largest in the world. All of these contain the beautiful and interesting deposits known as stalactites and stalagmites. Fingal's Cave, in the Scottish Isle of Staffa, is a well-known sea cave carved by the waves in a lava flow.

Caves are interesting to geologists for several reasons. In many parts of the world, fossils of animals, some of them of extinct species, are found in caves, and these throw much light on the geologic history of the localities where they exist. In the Old Stone Age, man used caves as habitations, and the bones and other relics of these cave men are of absorbing interest to the anthropologist and the geologist. Pictures of animals and men, engraved or painted on the walls, have been found in caves in France and Spain. In some parts of China the people have excavated caves in loess which have been inhabited for centuries.

L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles:

Carlsbad Cavern	Luray Caverns
Cave Dwellers	Mammoth Cave
Civilization	Stalactites
Fingal's Cave	Stone Age
Geology	Wyandotte Cave
Loess	

CAVE DWELLERS. In various parts of the world there have been discovered interesting caves of a former age, containing bones of animals and human beings, remains of tools

and weapons, and other debris. The examination and study of these have led scientists to believe that ages ago such caves were the habitations of primitive people. To these rude householders of a remote past, students of archaeology apply the name *cave dwellers*, or *cave men*, and the caverns in which they lived are classified according to various geologic periods. The earliest cave dwellers of Europe of whom there is much detailed knowledge ranged over England and Wales, France, Belgium, Germany, Hungary, and Switzerland. In their dwellings have been found implements of warfare made of bone and unpolished stone, and pieces of bones of animals slain with these crude weapons. There are piles of awls, lance-heads, hammers, and saws, arrow heads and harpoons, and needles made of bone. The animal remains are those of the reindeer, horse, ibex, bison, antelope, musk sheep, cave bear, and lion.

This group of cave men lived by hunting and fishing, and wore garments of skin sewed together with the sinews of the reindeer or strips of intestine. They used stone lamps filled with fat to illuminate their dwellings, and had a knowledge of fire, but possessed no domestic animals. Though they knew nothing of spinning or of the art of pottery-making, they were skilful in drawing animal figures, as evidenced by numerous pictures engraved on stone and ivory. Among the primitive races of today, the Eskimos are nearest in habit to these ancient cave men.

There are other groups of caves in Europe showing varying degrees of civilization, some of which were occupied well into the historic era. Some of the later caverns are believed to have been inhabited by men of refinement who were forced to take refuge in them during periods of invasion. In Southwestern United



MOUNT EDITH CAVELL

Photo by Canadian National Railway

States there are remains of lodging places excavated in cliffs, but the races inhabiting these are known as Cliff Dwellers (which see). c.w.

CAVELL, *ka vel'*, EDITH (1865-1915), an English nurse whose tragic death made her a martyr of the World War. In 1915 she was in charge of a hospital in Belgium where German authority had followed successful invasion. She was accused of assisting British, French, and Belgian soldiers to escape from Brussels to England, and when arrested made no denial. The story of the treatment accorded her became known to the world only through the official investigation and report of Brand Whitlock (which see), United States minister to Belgium, who was also in charge of British interests in that country.

Miss Cavell was arrested on August 5; on October 10 the American minister learned that she was to be executed forthwith, and the sentence of the court-martial was carried out regardless of the efforts of Whitlock and others to avert it. It became a part of the official report that the members of the firing squad, finding their task distasteful, aimed their shots indifferently and she was wounded only by one bullet, whereupon a German officer put his revolver to her ear and fired.

A great memorial service was held in Westminster Abbey, London, and the nation erected a statue to her memory in that city. In Canada, in 1918, Mount Gieki, in Jasper Park, Alberta, was renamed Mount Edith Cavell, in her honor. Her body is in Norwich Cathedral.

CAVENDISH. See DEVONSHIRE, DUKE OF.

CAVE OF MACHPELAH, *mak pe' lah*. See HITTITES.

CAVE OF THE WINDS. See NIAGARA FALLS.

CAVIAR, *kav' i ahr*, or *ka vyahr'*, OR **CAVIARE**, a table delicacy prepared from the roe of the sturgeon and other large fish. Caviar has a peculiar piquant taste which in popular fancy can be truly appreciated only by refined palates. Thus it seems to have been considered in Shakespeare's time, for Hamlet is made to say of a certain play that it "pleased not the million; 'twas caviare to the general." Formerly a delicacy within the purse only of the well-to-do, caviar is now served in medium-priced restaurants. It has been popular in Russia for centuries, as the Caspian Sea sturgeon furnishes an especially good quality. Since the middle of the nineteenth century large quantities of the roe of lake sturgeon have been prepared for market in the United States. The eggs are freed from the enclosing tissue by being rubbed through a wire screen. They are then washed and rubbed with salt, after which they are dried and packed.

CAVITE, *kah ve' ta*. See PHILIPPINE ISLANDS (The Cities).

CAVOUR, *ka voor'*, COUNT CAMILLO BENSO DI (1810-1861), a far-sighted Italian statesman whose efforts to unite the Italian people under a single ruler gave him a place among the "nation-makers" of the world. He entered the Parliament of Sardinia in 1848, when the whole Italian peninsula was aflame with the spirit of patriotism. In 1852 he became the Prime Minister of Victor Emmanuel, king of Sardinia, and in this office he worked with one aim in view—the union of Italy under a central government which should be independent of Austria. His first step was to make Sardinia an ally of England and France in the Crimean War, thus securing for his country recognition of the European powers in the peace congress at the close of the war. He then forced Austria into a war with Sardinia, which resulted in a victory for the Italian state and the annexation of the greater part of Lombardy. With the help of Garibaldi, Cavour was able, in 1861, to unite all Italy except Venice and Rome, and he lived to see the meeting of the first Italian Parliament.

Related Subjects. The reader is referred in these volumes to the following articles.

Garibaldi
Italy (History)

Sardinia, Kingdom of
Victor Emmanuel II

CAVY, *ka' vie*. See GUINEA PIG; AGOUTI, for classification.

CAWNPORE, *kawn' pore*. See INDIA (Cities).

CAXTON, WILLIAM (1422-1491), a celebrated English printer, whose introduction of the art of printing into England laid the foundation for the literary glories of the Elizabethan Era. In his youth, he was apprenticed to a London merchant, and after the death of his master went over to Bruges in Belgium, where he established a business of his own. There he prospered in his trade and also mastered several languages. In the course of time, he made a translation into English of a popular romance about the story of Troy, and in order to obtain several copies of it he learned the newly discovered art of printing. This work was printed at Bruges or Cologne about 1474, and is the first book printed in the English tongue.

In 1476 Caxton returned to England and set up a printing shop in one of the almshouses near Westminster Abbey. In 1477 he published the first book printed in England, entitled *Dictes and Notable Wise Sayings of the Philosophers*. From that time until his death, he was busily engaged in writing, translating, and printing, including among his publications many of Chaucer's stories and Malory's tales of King Arthur. His services to English literature cannot be overestimated; his numerous translations helped to fix the literary form of the language, and his introduction of printing is among the events that brought about the revival of learning in England.

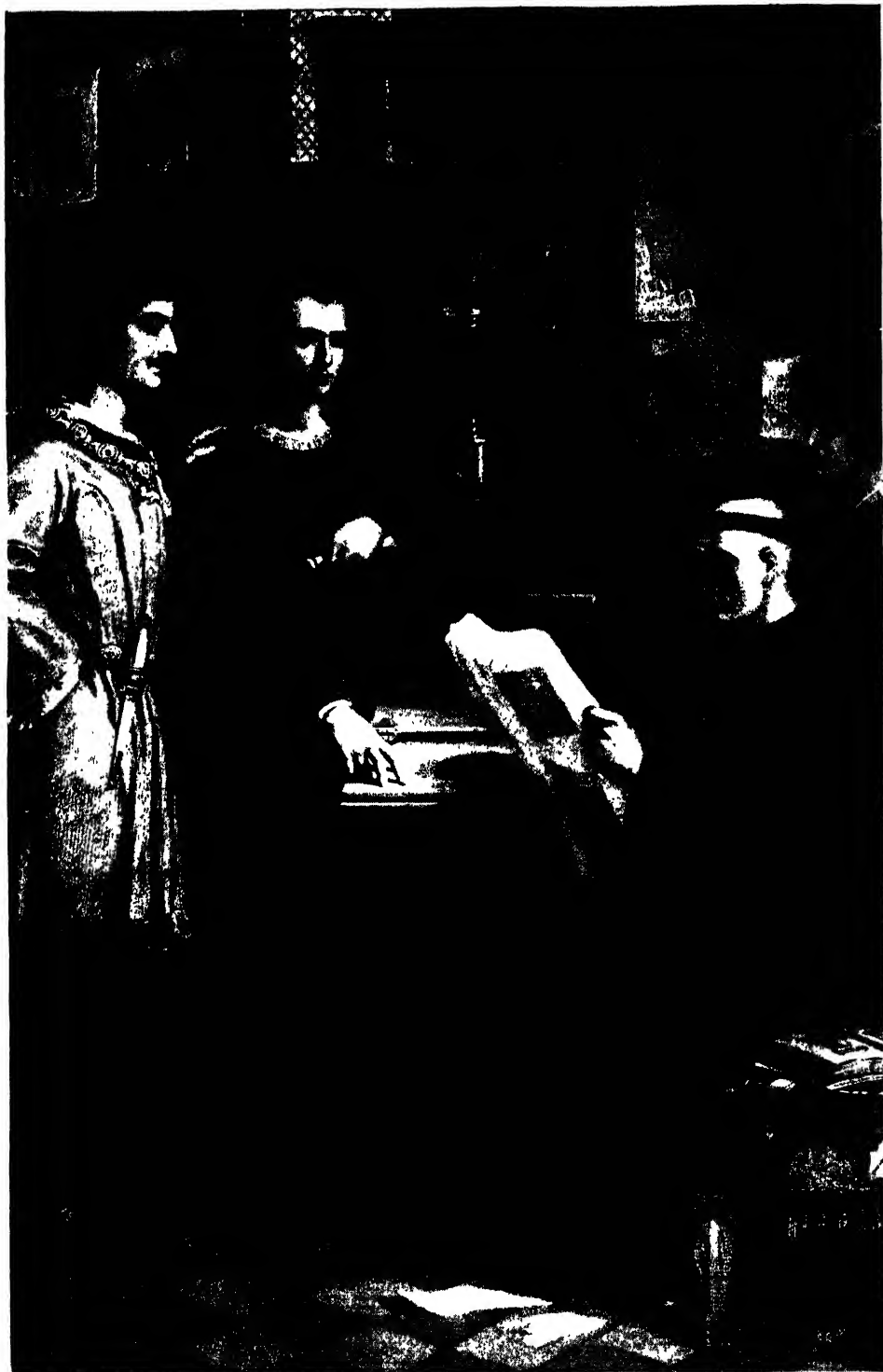


Photo. Brown Bros.

Caxton Introduced Printing into England. An abbot of Westminster examines a proof printed on the new Caxton press. He sees the end of laborious hand-lettering of manuscripts in the monasteries. Caxton is the central figure.

CAXTON MEMORIAL BIBLE. See **BIBLE** (Famous Versions of the Bible).

CAYAMBI, *kah yahm' be*, an Andean peak. See **SOUTH AMERICA** (Plains and Mountains).

CAYENNE, *ka en'*, or *ki en'*, another name for French Guiana (which see).

CAYENNE LAPWING. See **LAPWING**.

CAYUGA, *ka yoo' gah*. See **INDIANS, AMERICAN** (Most Important Tribes).

CAYUGA LAKE, a beautiful lake, one of the group known as the *Finger Lakes*, from their long, tapering shape. It is situated a little west of the center of the state of New York, is thirty-eight miles long and from one to three and one-half miles wide. It discharges its waters into Lake Ontario, through the Seneca and Oswego rivers. The principal towns on its banks are Cayuga, Ithaca, and Aurora. At Ithaca, the site of Cornell University, boat races take place on the waters of the lake every summer between crews from Cornell and those of other colleges and universities. Its southern end extends down to Ithaca's city limits. The lake is much frequented by tourists.

CEBU, *su boo'*, formerly **ZEBU**, one of the smaller islands of the Philippine group. In the cathedral in the capital city, also called Cebu, is preserved a cross said to have been erected by Magellan (which see) when he landed on the island in 1521. See **PHILIPPINE ISLANDS** (Some of the Islands in Detail).

CECILIA, *se sil' yah*, **SAINT**, the patron saint of music, a favorite subject for the songs of poets and the brush of artists. She suffered martyrdom about A.D. 230 and received the martyr's crown.

In the Roman Catholic Church her festival (November 22) is celebrated with beautiful music. Her story forms one of Chaucer's *Canterbury Tales*, and Dryden in his *Alexander's Feast* and Pope in his *Ode on Saint Cecilia's Day* have sung her praises. Raphael, Domenichino, Dolce, and Mignard have represented her in celebrated paintings. The Church of Saint Cecilia in Rome is one of the city's most beautiful places of worship. Beneath its high altar are the tomb and the recumbent statue of the saint.



Photo: Visual Education Service

SAINT CECILIA

From a painting by Raphael

CECROPS, *se' krops*, a character who figures in Greek tradition as the first king of Attica and the builder of the famous citadel of Athens, named Cecropia in his honor. Various stories sprang up about him; he was said to have introduced marriage, the burial of the dead, and writing and other arts. In the myths, he is a half-snake, half-man, who came from Crete or from Egypt and founded the city of Athens. When Athena and Poseidon disputed as to which should have the honor of naming the city, Cecrops decided in favor of Athena.

[See articles in these volumes relating to the mythological characters named above]

CEDAR, a name popularly applied to several different trees in the western hemisphere, but properly belonging to three species native



THE CEDARS
Trees and cones

to the Old World. The true cedars are famed for their fragrant, durable, reddish wood, so admirably suited to cabinet-making. They include the *deodar tree* of India, the *Atlas cedar*, found at high altitudes in North Africa, and the *cedar of Lebanon* (see subhead, below).

Though no true cedars occur in North America, there are several American cone-bearing trees of fragrant wood that are called cedar with some appropriate qualifying term. *White cedar* is applied both to the arbor vitae and a species of cypress of the Atlantic coast. The common juniper is often called *ground cedar*, and an eastern species of juniper is known as *red cedar*. The wood of this tree is extensively used for "cedar" chests and lead pencils. The so-called *western red cedar*, an important lumber tree of Canada, belongs to the same genus as the arbor vitae.

Cedars of Lebanon. The beautiful, stately cedars of Lebanon, referred to in the Bible, once occupied large tracts on Mount Lebanon in Palestine. To construct the wonderful Temple of Solomon, King Hiram of Tyre furnished wood from the cedars of Lebanon. The gigantic task was done by 80,000 hewers, and must have taken a very long time. These conifers are remarkable for the size of their trunks; they also develop widespread

branches instead of assuming the typical cone-shaped form of most evergreens. The magnificent forests of Solomon's day have been



CEDARS OF LEBANON

[Photographed by P. H. DuBois, Beirut, Syria]

reduced by the "blight of time and man's touch" to a few isolated groves. See **LEBANON**, **MOUNTAINS OF**. G.M.S.

Scientific Names. The true cedars belong to the genus *Cedrus* in the pine family, *Pinaceae*, and their scientific names are as follows: deodar tree, *Cedrus deodara*; Atlas cedar, *C. atlantica*; cedar of Lebanon, *C. libani*.

Related Subjects. The reader is referred in these volumes to the following articles.

Arbor Vitae Cypress Juniper

CEDAR CREEK. See **WAR OF SECESSION**.

CEDAR RAPIDS, IA., an important manufacturing city, and a distributing center for the state. It is situated in Linn County, in the eastern part of the state, about midway between the northern and southern boundary lines. Cedar River divides the city into two sections, known as the East Side and the West Side. Dubuque is seventy-nine miles northeast, Chicago is 210 miles east and north, and Saint Paul is 250 miles northwest. Saint Louis, Kansas City, Omaha, and Saint Paul are about equally distant from Cedar Rapids. Four large railway systems serve the city—the Chicago & North Western; the Chicago, Milwaukee, Saint Paul & Pacific; the Chicago, Rock Island & Pacific; and the Illinois Central. The first settlement was made in 1845, and named for the rapids in the river. The city was incorporated in 1856; it adopted the commission form of government in 1908. Population, 1930, 56,078.

Cedar Rapids is a blend of hill, dale, and winding river, with all the aspects of a modern, progressive city. The two sections of the town are united by nine concrete bridges, and their limits enclose miles of well-made streets, many beautiful churches, numerous handsome residences, public playgrounds, and parks. In addition to its public library and schools, the city has Coe College (Presbyterian), founded in 1881, and a Masonic library, the only exclusively Masonic library in the United States. The international headquarters of the Order of Railway Conductors of America is also located here.

Commerce and Industry. Owing to its location in a rich agricultural district, Cedar Rapids is a trade center of importance and has a large number of wholesale jobbing and commission houses. The rapids in the river furnish abundant power, and electric power is used by the greater number of the city's zoofactories. So extensive is the product of cereals that the city is locally called *The Cereal City*; two of its cereal mills are among the largest in the United States. It also claims to have the largest independent starch works and independent meat-packing plant in the Union. Pumps, windmills, iron pipe, and wire fence are also important manufactures. Railroad shops give employment to hundreds of men.

CEDAR RIVER. See **IOWA** (Its Waters).

CEDARS OF LEBANON. See **CEDAR** (Cedars of Lebanon).

CEDRELA. See **MAHOGANY**.

CEILING, ABSOLUTE. See **AIRCRAFT** (Table of Aeronautical Terms).

CELEBES, *sel' e beez*, one of the most important of the Dutch East India Islands (officially Netherlands India), situated between Borneo and the Moluccas. It is wonderfully rich in natural resources, and covers an area of 72,679 square miles, comparable to that of the state of Oklahoma. Gold is found in the valleys, and the northern portion abounds in sulphur and copper, with occasional valuable deposits of tin. Diamonds in small quantities and other precious stones in somewhat greater abundance are found, and there are extensive coal fields. The climate is tropical, and for Europeans, unhealthful.

Flowers and fruits grow in great profusion; cereals and vegetables are cultivated. Coffee and spice are the principal sources of wealth, but the trade in trepang is important (see **TREPANG**). Wild animals are numerous, including deer, buffalo, goats, baboons, and the peculiar babirusa (which see), a wild hog with double tusks growing between the eyes and snout. The inhabitants, mostly of Malay stock, are intelligent, industrious, and capable of a fairly high degree of civilization. In the interior there still remain remnants of barbaric tribes. The capital and most important port is Macassar, through which nearly all the foreign trade passes. The island has been in possession of the Dutch since 1660, except

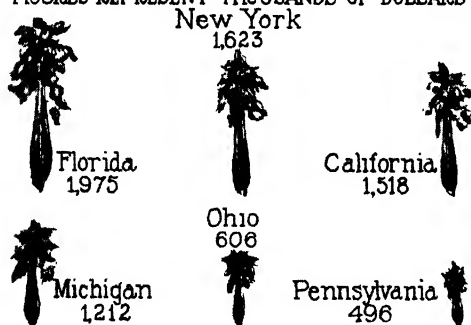
for a short period of 1811, when it was held by the British. Population, 1925, 3,314,350; only 3,000 of the people are whites, and they are in government positions or in trade. See colored map, article PACIFIC ISLANDS.

CELERY, a wholesome vegetable of the parsley family, native to the temperate parts of Europe, but now extensively grown in the United States and Canada. Wild celery is bitter, tough, and woody, and to some people poisonous, but in its cultivated form it is a crisp, tender, edible stalk, and is eaten either raw or cooked. Though celery is over nine-tenths water, and therefore of little value as a fuel food, it is one of the most important regulatory vegetables. It contains lime and iron, both of them essential for good blood, and has a large content of Vitamin B, which wards off anaemia, neuritis, and nervous debility (see VITAMINS). Furthermore, the large amount of cellulose, or fiber, in the stalk makes celery a good laxative food. It is commonly stored, in "root cellars" or otherwise, so



CELERY

FIGURES REPRESENT THOUSANDS OF DOLLARS

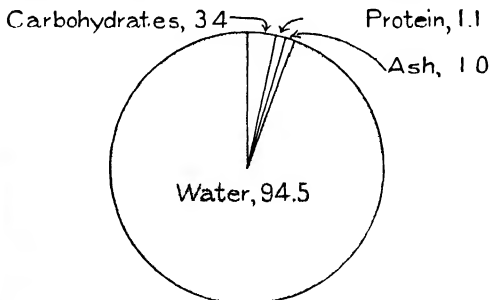


VALUE OF THE ANNUAL CELERY CROP
For average years

that we also have it through the winter, when it is at its best and when vegetables are especially needed in the diet.

Celery requires a fertile soil and plenty of moisture. Along with the onion, it is a chief crop of peaty or "muck" soils. Perhaps the most difficult part of its culture is the blanching, or whitening, process. This is accomplished by growing the plant in the dark, thus destroying the coloring matter in the plant

tissue and producing crisp, white stalks. The most common method of blanching on a small scale, and that which produces celery of the finest flavor, is to heap soil about the stalks.



COMPOSITION OF CELERY

For plants for early shipment, blanching boards are often placed on edge along each side of a row of plants.

In New York, Michigan, Florida, and California, thousands of acres are devoted to celery. Kalamazoo, Mich., is known as "the celery city"; almost all of that state's large celery crop is grown in the vicinity and shipped from that city.

In Florida and California, celery is an important winter crop.

B.M.D.

Scientific Name. Celery belongs to the family *Umbelliferae*. Its botanical name is *Apium graveolens*.

CELESTIAL EQUATOR. See RIGHT ASCENSION AND DECLINATION OF STARS.

CELESTIAL POLE. See POLE.

CELESTINE, *sel' es tin*, the name of five Popes, of whom the most noteworthy were Celestine III and Celestine V.

Celestine III, Pope from 1191 to 1198, came to the high office at the age of eighty-five. While he was a thoroughly conscientious man, he did not possess the force of character which the troubled times required. Emperor Henry VI immediately forced Celestine to crown him, and was strong enough not only to refuse the Pope the tribute which previous emperors had paid, but to appoint German bishops himself. Celestine excommunicated Leopold of Austria for his imprisonment of Richard the Lion-Heart and attempted to punish John of England for his treason during Richard's absence, but John refused to recognize his jurisdiction.

Celestine V became Pope in 1294, at the age of seventy-nine. Previous to that time he had won fame by the severity of the penances which, as a monk, he had imposed upon himself, and he had founded a monastic order known as the Celestines. One of his first acts was to issue a decree declaring that any Pope had the right to abdicate, and in December of the same year in which he was elected, he took advantage of this right and resigned his high office. His reason was that he wished to return to his devotions and severities. Boniface VIII, his successor, feared that a strong clerical party might grow up about Celestine, so he had the latter placed in prison, where he died.

CELILO CANAL AND FALLS. See IDAHO (Rivers); DALLES.

CELION, MOUNT. See SEVEN SLEEPERS.

CELL, the unit of structure in every living thing. All plants and animals, from lowest to highest, begin life as a single cell. The lowest animals, such as the amoeba, and the simplest forms of plant life, such as bacteria, never develop beyond the one-celled condition. Higher plants and animals are combinations of many cells, and in the body of man the number of cells is many times greater than the human population of the entire world. In the many-celled plants and animals, we find certain cells grouped together to form tissues, with the tissues forming organs designed for special functions. The living plant or animal is thus an *organism*, the sum total of numerous organs whose activity depends upon a multitude of cell units.

Even a single-celled creature is capable of carrying on certain vital processes. It can move, it responds to outside stimuli, it assimilates food, it breathes, and it reproduces itself. These activities are physical properties of the life substance of which every cell is composed, a colorless, semi-liquid material called *protoplasm*. Scientists know that protoplasm consists of carbon, hydrogen, oxygen, nitrogen, and some other elements united in various ways, but they do not know how the resulting mixture of compounds can give the cell the mysterious quality we call life. That is, no scientist has ever been able to mix and combine the elements in such a way as to form a living cell. Chemists are attempting this feat in the laboratory, but as yet without success.

Nevertheless, scientists have discovered many interesting facts about cells with the aid of the compound microscope. These units vary greatly in size, shape, and position, for infinite variety of function is their rôle. Egg cells, which contain nutriment for the embryo, are several inches across in some organisms, but most cells are microscopic. On an average, 2,000 to 4,000 cells placed side by side would make a row one inch long. Others are much smaller. There are 5,000,000 red cells in a volume of blood equal to one cubic millimeter. Cells occurring singly tend to take the shape of a sphere. When packed together, as they ordinarily are placed, they become spindle-shaped, polygonal, elongated, etc. Cells multiply by the process of division.

A typical cell consists of a central mass of protoplasm, the nucleus, floating in *cytoplasm*, as the protoplasm outside the nucleus is called. Each of these parts is highly specialized. The nucleus has been described as a little world in itself. It encloses granules of a deeply staining material known as *chromatin*, which, in a dividing cell, form bodies called *chromosomes*, of which there is a definite number

for every species of plant and animal. It is these bodies, biologists say, that carry the hereditary factors that determine the characteristics of the organism (see HEREDITY).

Cells vary so in size, shape, and structure that a detailed description of all types is not possible here. It is important to note that there are primitive plant cells lacking a nucleus, and animal cells in which the nuclear material is scattered, but all cells are enclosed by a membrane, even those that are called "naked." In the latter the membrane is so filmy it was formerly supposed to be non-existent. Cells may or may not be enclosed by a wall. Except in a few of the lowest plants, the protoplasm of plant cells manufactures hard walls of cellulose of varying thickness. When present, the wall of an animal cell is of soft albuminous material. The shells, horn, and other hard substances are not a part of them. R.H.

Derivation of the Name. In the seventeenth century, certain scientists, observing living plant tissues through the microscope, noticed in these tissues numerous small compartments that suggested prison cells. What they saw was the cellulose walls separating the life units. The name cell, applied by them to the boxlike structure, has been retained for the living masses within the walls.

Related Subjects. The reader is referred in these volumes to the following articles:

Amoeba	Cellulose
Animal	Plant
Bacteria	Protoplasm
Biology	Protozoa

CELLINI, *chelle' ne*, BENVENUTO (1500-1571), the most distinguished goldsmith of the Italian Renaissance, famed also as a sculptor, engraver, and writer.

In his youth, he began the study of the art of the goldsmith in his native city of Florence, but was driven out of that place as the result of a duel. Because he was quick-tempered and quarrelsome, he had to move frequently; he lived at various times in Rome, Florence, and other Italian cities, and at one time was in France. His whole life was a series of adventures, not always creditable.

Under the patronage of Pope Clement VII, Cellini became the greatest worker in metals of his time. Later, he was invited to the court of Francis I of France, and for that ruler modeled the famous bronze figure, *Nymph of Fontainebleau*, now in the Louvre. The best example of his work as a sculptor is the bronze statue of *Perseus with the Head of Medusa*.



Photo Brown Bros
CELLINI

which still adorns the open Loggia dei Langi, in the city of Florence. Richness of decoration and elaboration of detail characterize nearly all of his productions, and these qualities give to his work as a goldsmith marvelous beauty. His *Autobiography* is famous.

CELLO, *chel' o*. See VIOLONCELLO.

CELLOPHANE. See CHEMISTRY, page 1339.

CELLULOID, *sel' u loid*, a practical substitute for ivory, bone, hard rubber, and coral, is a manufactured product derived from the fibrous substance in plants that we call *cellulose* (which see). *Celluloid* is really a copyrighted trade name, owned by the successors of John Wesley Hyatt, who invented the process of making the substance. There are dozens of similar products marketed under special trade names, but none is so well known as celluloid. They are all called *synthetic plastics*, which means artificial substances capable of being worked into various shapes by heat and pressure.

When cotton fiber, a nearly pure form of cellulose, is treated with nitric and sulphuric acids in suitable proportions, a substance called *pyroxylin*, or *nitrocellulose*, is formed. Pyroxylin, in turn, when worked between rollers with camphor and a little alcohol, becomes a sticky solution that forms a transparent, colorless dough as the alcohol evaporates. This dough is the synthetic plastic that is so widely used for buttons, handles for knives, forks, and umbrellas, billiard balls, backs of brushes, piano keys, napkin rings, opera-glass frames, pipe stems, films for cameras, combs, chains, brooches, eyeglass frames, toys, paper cutters, and innumerable other small articles. By means of various fillers and dyes, the textures and colors of a great many natural products can be imitated, including, besides those mentioned above, tortoise shell, amber, ebony, onyx, and alabaster. Celluloid and other pyroxylin plastics are inflammable, and articles made from them should be kept away from flames. By varying the strength of the acids used, the basic cotton fiber is made into the highly explosive substance called *guncotton* (which see).

[For another type of synthetic plastic, see the article BAKELITE.]

CELLULOSE, *sel' u lohs*, a solid substance that forms the walls of plant cells, whence the name. We have examples of nearly pure cellulose in the fibers of cotton and flax (linen). As the principal material composing the framework of plants, cellulose comprises over thirty per cent of all vegetable matter. This substance is manufactured by all plants except a few of the lowest kind, those lacking chlorophyll (which see). Using energy from the sun's rays, plants manufacture sugar from carbon dioxide and water, taking the gas from the

air and water from the ground. By chemical processes little understood, a part of the sugar is transformed into cellulose, which becomes the skeleton of the plant that makes it.

Chemically, cellulose is a carbohydrate, a compound of three elements—carbon, hydrogen, and oxygen. Thus it is related to starch and sugar; the component elements, in fact, are found in cellulose and starch in the same proportions. Yet the two substances are wholly different in chemical properties and uses.

Uses of Cellulose. Like starch, cellulose swells when wet, and that prepared from corn pith is sometimes used as a lining in warships to prevent leakage through holes made by shells. Unlike starch, cellulose does not dissolve in hot water, and it reacts chemically with few other substances, except very strong acids and alkalies. Hence pure cellulose makes an admirable filter paper for the chemical laboratory.

Paper for books and newspapers, and for the innumerable articles now made from that product, is itself a derivative of cellulose; we might well say that it is cellulose, for all cheap paper consists chiefly of plant fiber. Cotton and linen pulp, wood pulp, and the fibers of corn, rye, wheat, jute, hemp, and several other plants are all used in paper manufacture. Cheap kinds of paper, notably newsprint grades, are made chiefly from wood pulp. A metropolitan newspaper of large circulation may consume 2,000 acres of forest in a year. In the manufacture of wood-pulp paper, calcium sulphite or some other powerful chemical is used to separate the cellulose from the useless lignin in the woody tissue. That cellulose can be acted upon by various strong acids and alkalies has increased its value to man a thousandfold.

When unsized (unglazed) paper is dipped into concentrated sulphuric acid and then into water, the cellulose swells, and on drying forms a hard, waterproof, greaseproof surface. Paper so treated is the parchment paper used for legal documents and maps instead of the more expensive sheepskin. The effect on cellulose of a strong alkali like caustic soda is seen in the manufacture of mercerized cotton. This lustrous fabric is made by passing cotton yarn through a cold solution of the alkali; shrinking is prevented by tension of the material, which is stretched while being dried.

Cellulose in the form of cotton waste is extensively employed in the manufacture of guncotton, a cellulose nitrate indispensable in warfare because it is used to make various kinds of smokeless powder. This nitrate is produced by treating the cellulose with nitric and sulphuric acids of sufficient strength to make the guncotton highly explosive. By varying the process, the manufacturer can produce pyroxylin, or collodion cotton, a

nitrate with a lower percentage of nitrogen, and therefore less explosive. Dissolved in ether and alcohol, pyroxylin is transformed into collodion, a colorless sticky fluid used technically and also as a covering for cuts and wounds. By evaporation of the alcohol and ether, a filmlike layer is left on the wound, which is thus protected from infection. In one process of making so-called artificial silk (called *rayon* in the trade), collodion is forced through tiny openings, and the streams that squirt out are hardened in warm air, forming solid filaments. After proper treatment with chemicals to make them less inflammable, the filaments are twisted together and become threads of cellulose "silk."

Pyroxylin is also the basis of various lacquers, paints, and enamels, and of artificial and patent leather; it serves, too, as a backing on photographic films. In addition, a number of plastic materials are made by treating pyroxylin with camphor. These materials are similar to the product called *celluloid*, a name that legally may be used by only one company. Pyroxylin products are somewhat inflammable, and cellulose acetates, made by substituting acetic for nitric acid, are coming into wide use. Moving-picture films manufactured from these acetates can safely be used in any place without a fireproof enclosure. The acetates are also utilized for automobile goggles, windows in leather automobile curtains, airplane wings, and electric-wire insulation. There is also an acetate process of making rayon.

The first successful method of producing substitute silk is the one described above in the section on collodion. It was devised in the same decade that mercerized cotton became a commercial success, in the year 1884. Since then, other processes have been perfected, but four-fifths of the rayon yarn now manufactured is produced by the *viscose* process, from spruce-wood cellulose. In this process the solution forced through the tiny holes is a viscous liquid (viscose) produced by treating the cellulose with an alkali and then with carbon disulphide. Viscose is also employed for sizing and waterproofing, in textile printing, and in the manufacture of substitute leather.

Cellulose is present in all foods of vegetable origin. It is especially abundant in the stalks and leaves of plants, and so we find a large proportion of it in such foods as celery, lettuce, and spinach. Only a little of the cellulose is digested by man, but it has been established that certain bacteria in the intestines form a digestive ferment that liberates glucose (which see). In addition, cellulose affords bulk and stimulates the peristaltic (churning) motions of the bowels.

B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles:

Carbohydrates	Explosives	Paper
Celluloid	Mercerizing	Parchment
Chemistry	Newspaper	Rayon
Cotton	Nutrition	Starch

CELOTEX, *sel' o teks* See LOUISIANA (Manufactures).

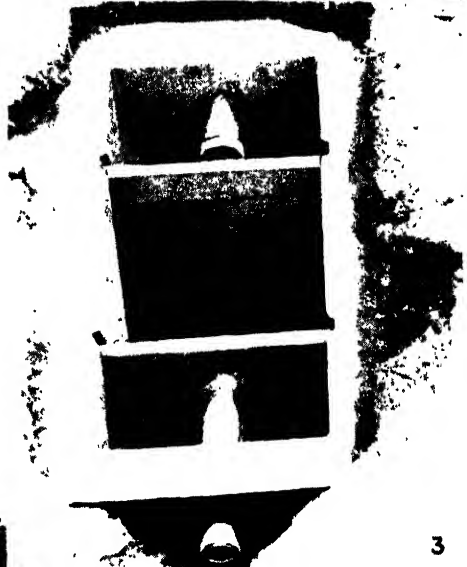
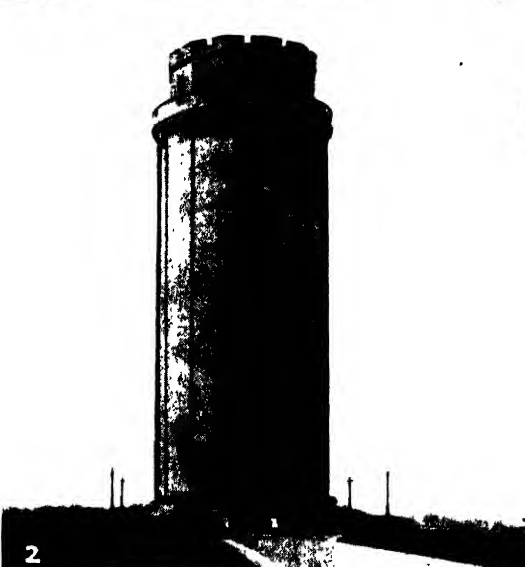
CELSIUS, *sel' si us*. See CENTIGRADE, sub-head.

CELTIBERIANS, *sel ti be' rih anz*, an ancient name applied for many centuries to the people of Spain. See SPAIN (History: The Three Conquests).

CELTS, *selts*, or *kelts*, OR **CELTIC PEOPLE**, a division of the Aryan branch of the human family, supposed to have been the first Aryan settlers in Europe. The onslaughts of the Teutons, Slavonians, and other races drove them westward, and at the beginning of the historic period they were the principal inhabitants of Britain, Ireland, France, Belgium, Switzerland, and Northern Italy. About 235 B.C., a Celtic tribe conquered and settled that portion of Asia Minor to which the name Galatia was given. The Celts were a restless, energetic people, and held their place in Western Europe until conquered by the Romans, who generally called them Gauls. Of the Celtic peoples surviving at the present time, there are two divisions, the *Gaelic*, or *Gadhelic*, comprising the Scotch Highlanders, the Irish, and the Manx; and the *Cymric*, comprising the Welsh and the Bretons (the people of Brittany). The Cornish dialect, formerly belonging to the Cymric group, became extinct only recently. See ARYAN; GAUL; ENGLAND (Fisheries).

C.W.

CEMENT, *sec ment'* or *sem' ent*. There are several kinds of material capable of causing bodies to adhere to each other, and to all of these the term cement may be properly applied. There is, however, one kind of cement that is of such outstanding importance in the world of industry that this material is nearly always meant when the term is used. The cement of industry is *portland cement*, a fine gray powder that is used to bind pieces of hard material together to form concrete. The story of concrete is told elsewhere in these volumes under that heading, but it is appropriate to emphasize here the widespread use of this strong building stone and to remind the reader that its manufacture depends upon portland cement, with which this article is concerned. In the century or so since portland cement was first manufactured, concrete has made its way into every field of activity, and because of it we have sanitary, permanent offices and factories, dams and bridges that are triumphs of engineering skill, locks such as those on the Panama Canal, smooth, durable highways, and hundreds of other improvements that are characteristic of our "age of concrete."



Uses of Cement. (1) An outer-drive viaduct near Detroit, Mich. (2) Waterworks standpipe, Kansas City, Mo. (3) A septic tank (seen from above), cover removed. (4) Tree surgery. (5) One of four double cribs on an Iowa farm.

Cement and concrete are terms that are often confused. From the statements above, the reader will see that concrete is the final product, and cement the material that acts as a binder. It is not technically correct to speak of a cement sidewalk. The sidewalk is made of concrete, which is defined as a mixture of portland cement and water with sand, pebbles, crushed rock, crushed slag, or other suitable aggregates. The cement and water form a paste that welds the inert materials into a solid mass as the mixture sets and hardens. Because the binder hardens under water, it is classed as *hydraulic* cement.

Building Materials of Long Ago. Cement in its present form is a comparatively young construction material, but the masonry of the ancients shows that they knew how to make and use cementing materials and concrete. Two thousand years ago, the Roman builders were not only extensive users of cement but also were interested in obtaining better concrete through experimentation.

In viewing the foundations of the Forum structures as they stand to-day, the observer finds proof that the early craftsmen were not in accord in regard to the use of coarse, broken stones that they mixed with cement, sand, and water to form concrete. In the effort to secure a better concrete, some Roman builders laid the concrete in layers, alternate layers being made with different stones. Others preferred to mix the different kinds of rock together, and the concrete was dumped in the forms in one mass, without distinction as to layers (this is the method used by builders of the present day). Yet with their unscientifically manufactured cement, made from volcanic ash and lime obtained from burnt marble, and their haphazard mixing methods, the ancient Romans built concrete foundations which appear to be as sturdy to-day as they were during the days of Julius Caesar.

The Romans made their cement by mixing slaked lime with ashes deposited by Vesuvius and other less famous volcanoes. So, without the aid of the laboratories of the present day, the Romans made cement which served their purpose well, even though their product was not at all uniform. The cement of the Romans also had the desirable characteristic of modern cement in that it would harden under water. See *ROME*; *FORUM*.

Yet there is a wide gulf between the cement of early Rome and the product which is used so extensively to-day. After the fall of the Roman Empire, cement-making, along with a good many other arts, disappeared for a time, and was not revived until the middle of the eighteenth century. But after its rediscovery, the changes in manufacturing methods came about rapidly until the present highly scientific cement was developed.

The Age of Portland Cement. A cement which would harden under water was made by an Englishman in 1756. This hydraulic cement was used in building the first satisfactory foundation for the Eddystone lighthouse, off the coast of England. The product was improved at various times by later experimenters, but it was not until 1824 that portland cement was invented. Joseph Aspdin, a stone-mason of Leeds, England, discovered that a better cement could be made by powdering, burning, and grinding the materials proportioned by himself rather than by using the ready-made materials provided by nature. Aspdin called his product "portland cement" because the concrete made from it resembled a hard stone quarried on the Isle of Portland, a rocky peninsula extending into the English Channel, off the southern coast of England. Saint Paul's Cathedral, Westminster Abbey, many of the old castles, and various other buildings in England are of Portland stone.

The portland cement in use to-day is a greatly improved product made according to strict specifications. When the industry was getting into its stride, about the year 1890, each manufacturer made a product representing his own idea or the desires of customers. Good and indifferent cements continued to appear on the market for many years, and in 1898 a compilation was made covering ninety-one different specifications. The situation is wholly different to-day. Cooperation between the American Society for Testing Materials, the United States Bureau of Standards, and other technical organizations has brought about uniform requirements. After exacting experiments and study, a single set of specifications was established in the United States in 1921. All portland cement in America is now manufactured in accordance with these specifications, and the builder is assured material which meets them, regardless of the source of the product. "Portland cement" is not, of course, a trade name. It is a general descriptive term which appears on the sack, together with the special designation or trade name of the individual manufacturer. This cement is made in practically all industrial countries, and in the United States alone there are over 160 plants, in thirty-two states.

How Portland Cement Is Made. This key material in the stone that builds great dams and bridges, skyscrapers, and other structures that need to be tremendously strong, is made up of particles that are finer than those of flour. More than eighty operations are involved in its manufacture, but from the moment the material is dumped into the crusher until it is sacked, the product is as untouched by hand as is the bread of the modern bakery. Two general processes are in use, differing

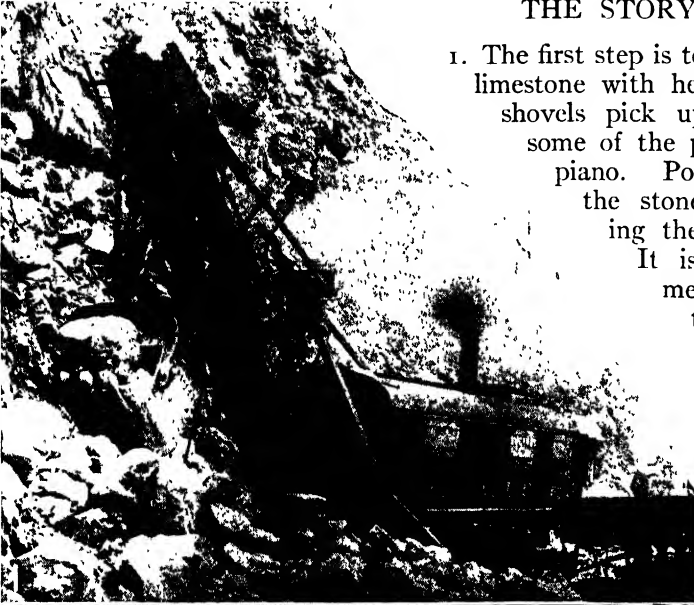
(Continued on page 1281.)

How CEMENT *is* MADE

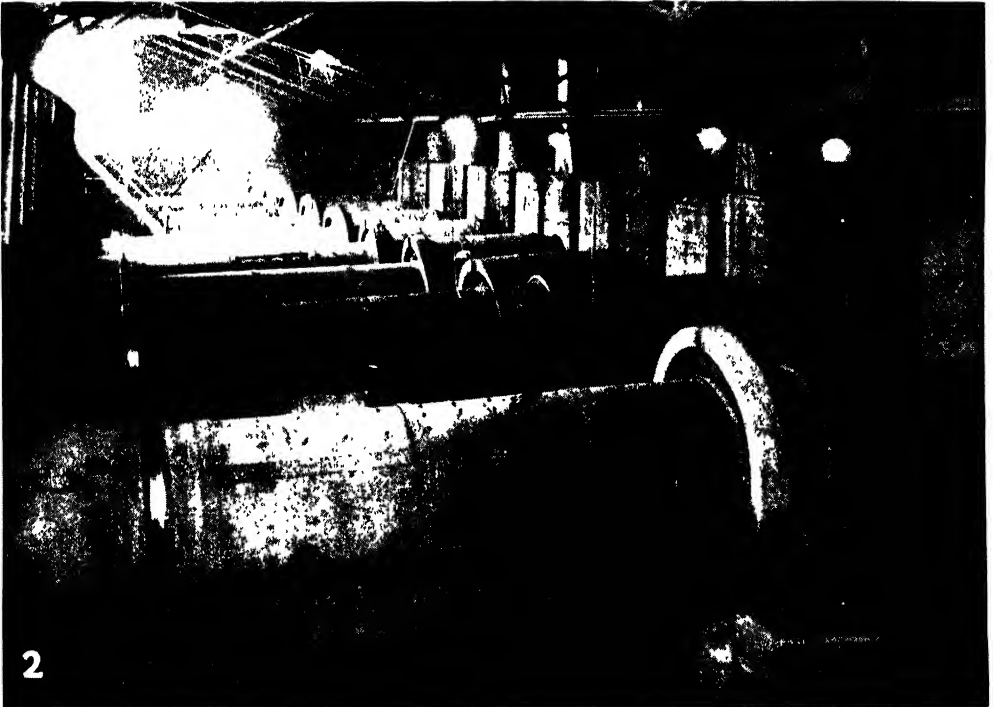
BY THE DRY PROCESS

THE STORY IN PICTURES

1. The first step is to blow up a mountain of limestone with heavy explosives. Steam shovels pick up the shattered stone; some of the pieces are as large as a piano. Powerful machines break the stone into chunks, averaging the size of a human fist. It is then ready for shipment to the cement factory, where it is put into vast bins.



2. There is moisture in the limestone. To drive this off, a battery of large rotary driers, heated with



burning blasts of powdered coal, is employed. (The cement industry is the largest user of powdered coal in the world.)

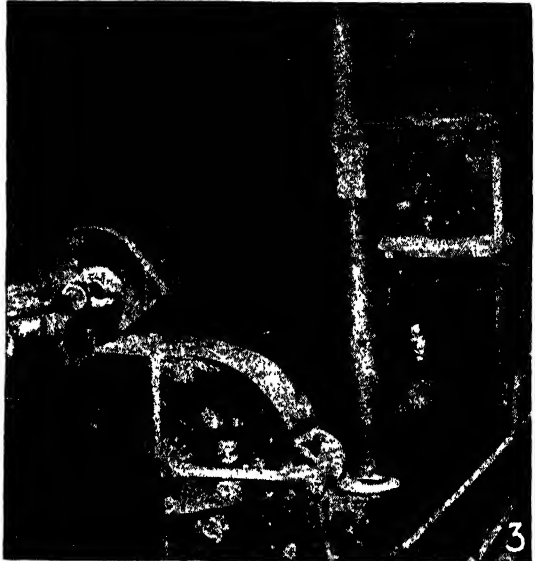
3. After thus being dried thoroughly, steel "hammer mills" pound the dried stone into powder.

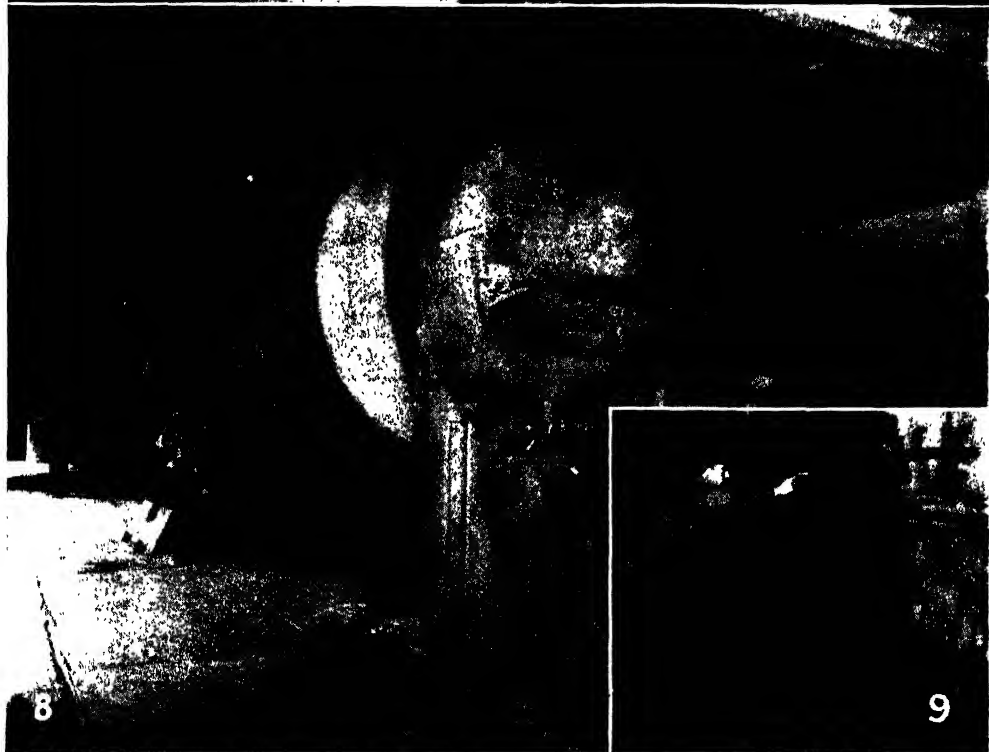
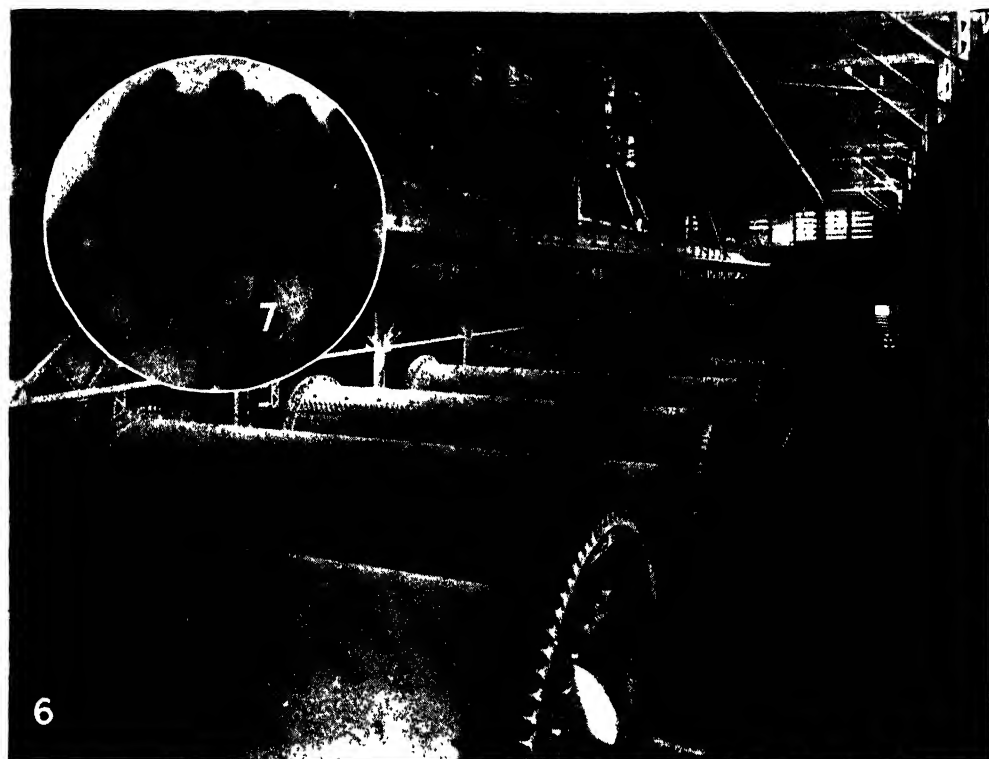
4. Throughout the manufacturing process, physical and chemical tests are practically continuous. Here is a test to facilitate proportioning and weighing of materials.

5. The third of the raw materials after limestone and powdered coal entering into the manufacture of cement is slag. This is brought from blast furnaces and is mixed with the limestone.

6. The mixed limestone and slag next go to tube mills to be pulverized to a powder-like fineness, the latter determined and controlled by the laboratories.

7. In these cylinders are 25 tons of steel balls, used to pulverize the contents. Some of the steel balls are here shown.





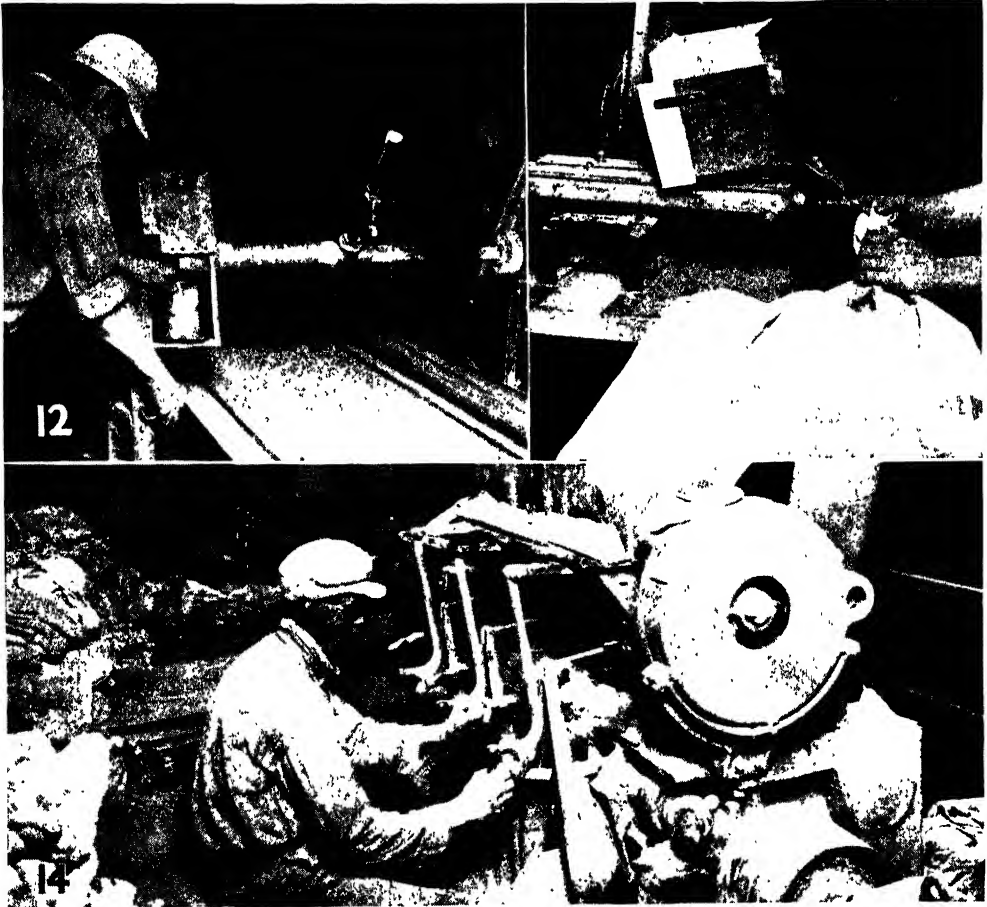
8. Cement kilns are the largest pieces of revolving machinery in modern industry. Each is longer than a residence lot, is large enough to drive a small automobile through it, and weighs more than 1,000,000 pounds. Each kiln is set at a slight angle from the horizontal; if stood on end it would be as tall as a 20-story building. With its load of raw material, each weighs as much as a train of eight steel Pullman cars. Some of these cylinders are 250 feet long; all are lined to a depth of a foot with highly refractory fire brick. Heated by flames of pulverized coal to a temperature as high as 3,000° F. (greater than that required to melt steel—heat even greater than that found in the crater of a volcano), these fiery furnaces all but melt the powdered stone into slag and produce the physical and chemical changes that give portland cement its cementing qualities. A constant stream of raw materials enters one end of the kiln for a three-hour journey. Into the other end, a burst of air traveling at the rate of a mile a minute carries the powdered coal, which ignites and goes roaring along, a leaping 40-foot tongue of fire, to meet the raw materials. Each particle that leaves the kiln is neither limestone nor slag, but new complicated chemical compounds of alumina, silica, and lime. The semi-fused material, now known as clinker and ranging in size from a pea to a walnut, drops from the kiln and is conveyed to storage piles, where it cools. Samples of freshly made clinker are continually taken for physical and chemical tests in the laboratories.

10



11





9. Sometimes the clinker sticks to the side of the kiln and men with machine guns have to shoot the clinker in order to free it from the inside walls and permit its onward movement.

10. Here is a clinker storage pit. Clam-shell buckets, operated by a crane, pick up and carry the clinker to the finishing mills. It is run through several of these finishing mills, and when it emerges from them, the material is pulverized so fine that it will go through a sieve whose mesh is so small that there are 40,000 openings to the square inch.

11. This sieve with 40,000 openings to the square inch is so fine that it will hold water, yet finished cement goes through it.

12. A conveyor belt carries the finished cement to stock-houses. On its way, an automatic sampler each eight seconds takes a sample and deposits it in a locked container for exhaustive chemical tests in laboratories.

13. Unlike most packages, cement sacks are tied before they are filled. In this picture, the ends of the sack are being tied with wire ties.

14. Cement sacks are filled through an automatic self-closing flap or vent in one corner. This is placed over the nozzle of the filling machine by the workman, and when 94 pounds (one cubic foot) has entered, the flow ceases, the workman pulls a lever, the flap automatically closes and the sack of cement drops to a belt conveyor which carries it to workmen for loading on cars or trucks.

15. In connection with this apparatus is a sieving machine with 40,000 openings to the square inch. It makes 2,400 tests of fineness each day of both raw mix and cement, to make sure that the finished product conforms to standard specifications.

16. An air analyzer is here shown. This machine separates cement particles into four sizes, one being small enough to go through a sieve with 4,840,000 openings to the square inch (if it were possible to make a sieve that fine, it would be more than 100 times as fine as the one shown in Illustration Eleven). Experiments show that it would require 10,000,000 of these cement particles, laid closely together, to cover a square inch.

17. A compressing machine is shown. This makes exhaustive tests of the downward pressure which cement will sustain.

18. This machine has a pull upward, which determines tensile strength, three days, ten days, and twenty-eight days or longer after manufacture is completed, to make sure that cement measures up to strength requirements.



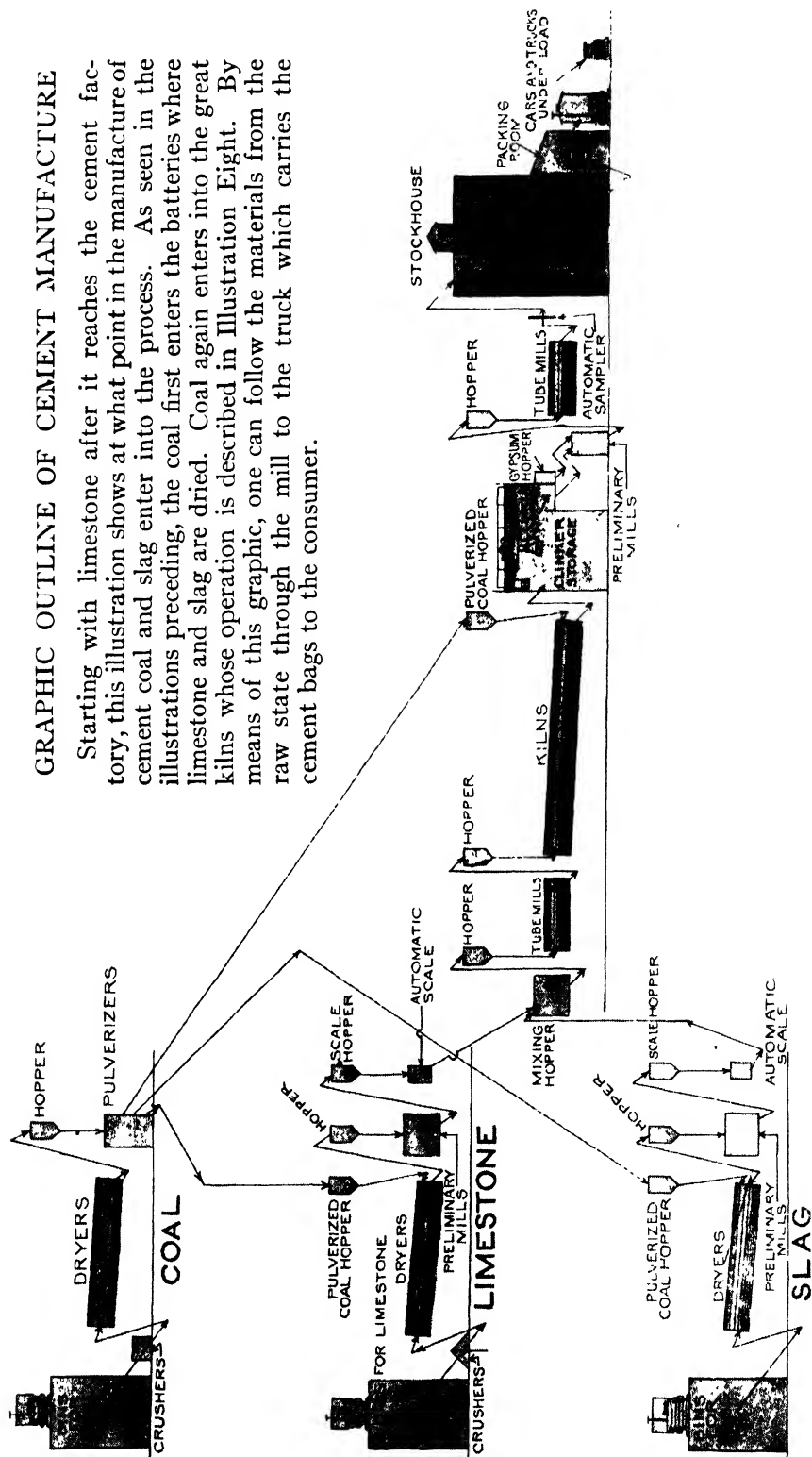


19. The laboratory operates day and night, making thousands of tests of all ingredients daily, precisely and accurately. For example, the scales shown are so delicately adjusted that they will weigh even the mark of a pencil on paper.



GRAPHIC OUTLINE OF CEMENT MANUFACTURE

Starting with limestone after it reaches the cement factory, this illustration shows at what point in the manufacture of cement coal and slag enter into the process. As seen in the illustrations preceding, the coal first enters the batteries where limestone and slag are dried. Coal again enters into the great kilns whose operation is described in Illustration Eight. By means of this graphic, one can follow the materials from the raw state through the mill to the truck which carries the cement bags to the consumer.



in method but not in principle. In the *dry* process, the materials are fed into the kilns in the form of a dry powder. In the wet process, enough water is added to the materials to permit their being ground into a soupy mixture called *slurry*. The material is pumped into the kilns in this form.

Composition. The essential minerals in the cement are lime, silica, and alumina. These substances occur in nature in a wide variety of materials, but a standard grade of portland cement contains, on an average, ingredients from the following sources:

Lime, 60 to 64 per cent, derived from limestone, cement rock, marl, or oyster shells (Cement rock is a stone, found principally in Pennsylvania, that combines the necessary elements in approximately the right proportions)

Silica, 10 to 25 per cent, obtained from clay, shale, cement rock, or blast-furnace slag

Alumina, 5 to 9 per cent, also obtained from clay, shale, blast-furnace slag, or similar materials See SLAG

Small amounts of ironoxide, magnesia, and sulphur trioxide will be present

Assembling the Materials. The first step in the process of making cement consists in blasting down rock in the quarries. It is not unusual for 100,000 tons of stone to be torn loose with a single charge of high explosives. More than 18,000,000 pounds of these explosives are used in one year by the portland-cement industry in America. The fragments of rock are loaded by steam shovels onto cars and are carried to the mills by railroad or boat, according to location. Clay is usually dug by steam shovels, but shale, which is hard and stonelike, must often be quarried like limestone.

Crushing and Grinding. Large crushing and grinding equipment is needed to prepare the rock for the kilns. In the gyratory crushers, which operate somewhat on the principle of a coffee mill, solid lumps of rock three feet in diameter are squeezed into small particles as easily as a squirrel cracks a nut. After leaving a gyratory crusher, the rock fragments are reduced to smaller size in a hammer mill. The material is then dried in a rotary drier heated by a flame of powdered coal, is carefully proportioned, and is then ready for pulverizing.

In the first stage of pulverizing, the rock mass is passed through a *ball mill*. This is a horizontal steel cylinder six to eight feet in diameter and four to six feet long. It makes twenty-three to twenty-five revolutions a minute about its horizontal axis. Curved steel plates arranged in steps form the lining of the drum, which is partly filled with steel or chilled-iron balls or slugs.

As the cylinder rotates, these balls are carried up the ascending side to be thrown out and down to the bottom again. The sharp blows

delivered by the falling balls break up the particles caught between them and others at the bottom of the drum. The material to be ground is fed in at one end of the cylinder, and when fine enough passes through an enveloping screen fastened to the steel lining plates.

From the ball mill the mixture usually goes to a *tube mill*, which in operation is like the former. It is much longer and may contain flint pebbles or smaller steel balls. Here the final grinding is accomplished, producing particles so fine that eighty-five per cent will pass through a sieve so fine that it holds water. See illustration.11, page 1276.

In the Kilns. When the raw materials in either process have been finely pulverized, they are ready to go to the kilns. In these great rotary cylinders—the largest pieces of revolving machinery known to industry—the most critical process in the making of portland cement takes place.

In their finely pulverized state (wet or dry), the raw materials are fed into the upper end of the rotary kiln and start upon a two-hour journey through a region that in heat outdoes Dante's inferno. This rotary kiln is a great steel cylinder that may be from eight to thirteen feet in diameter, and from 150 to 340 feet long. A moderate-sized kiln is ten feet in diameter and 200 feet in length. Kilns are supported on roller bearings, and by means of large gears are rotated approximately three-quarters of a turn a minute. In order that the material will continuously pass through, the kiln is inclined a few tenths of an inch to the foot of length.

Inasmuch as the chemical composition of the material as it leaves the kiln is that of the finished cement, the greatest care must be taken in the burning. As well as being one of the very important steps, it is the most spectacular. It may aptly be called the big "scene" in the great impersonal drama of cement-making.

Hot gases from the flames in the lower end of the kiln pass over the mixture as it enters the cylinder and gradually drive out all the remaining moisture, which in the wet process makes up about one-third of the weight of the slurry.

As the material slowly passes down the kiln, it becomes hotter and hotter until it reaches the burning zone in the lower third of the kiln. Under the influence of the intense heat, the intimately associated particles react chemically to form new compounds and emerge from the end of the kiln as white-hot balls as big as marbles, known as *clinker*.

The intense heat required to bring the mixture to the point of fusion—a temperature of from 2,500 to 3,000 degrees Fahrenheit—is usually secured by burning finely powdered coal, although oil or gas is also used. Blown

in under pressure, the coal burns with a roar in a tongue of flame thirty to forty feet long. Were it not for the thick lining of firebrick, the heat so generated would melt the steel shell of the kiln.

Final Processes. The clinker emerging white-hot from the kilns passes through long cylindrical coolers to storage piles. When the clinker is taken from storage for grinding into portland cement, a small amount of gypsum—from two to three per cent by weight—is added to regulate the rate of hardening of the cement when used.

Machines used for final grinding of the clinker are similar to those described for grinding of the raw materials. As before, there are two stages, the preliminary and the final grinding. From the first mill, the material emerges in the form of particles about the size of sand grains. From the second, it comes out so finely ground that at least seventy-eight per cent will pass through a sieve having 40,000 openings per square inch. This powder is the finished portland cement.

From the finishing mills, cement is conveyed to storage bins, where it is held in bulk pending shipment to fill orders, or it may go directly to the shipping department, where it is placed in sacks for distribution to the consumer. Here again, time-saving methods and machinery have been adopted. Even the sacks are tied before filling. They are filled through the bottom by means of a flap valve which closes when the sack is placed right side up. For the convenience of the user, each sack contains ninety-four pounds of cement, or one cubic foot.

J.B.M.

[An important reference to cement will be found in the article **STANDARDIZATION IN INDUSTRY**.]

CEMENTUM, *se ment' um*. See **TEETH**.

CENIS, MONT. See **MONT CENIS TUNNEL**.

CENOZOIC, *se no zo' ik*, **ERA**, the latest of the eras of geologic time, extending from the close of the Mesozoic Era to the present. The name, which is of Greek derivation, means *pertaining to recent life*, as throughout the era both plants and animals steadily grew more like the forms that now exist. At some time during the era, though the exact epoch has not yet been ascertained, the family of mammals to which the human race belongs is believed by evolutionists to have been developed. In the classification used by the United States Geological Survey and by many geologists, the era is divided into the *Tertiary* and *Quaternary* periods, each of which is subdivided into series. Some geologists prefer to abandon the names Tertiary and Quaternary.

L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles:

Evolution
Geology (Divisions of
Geologic Time)

Quaternary Period
Tertiary Period

CENSER, *sen' sur*, a vessel in which incense is burned during religious ceremonies. Among the ancient Jews, it was used to offer perfumes in sacrifices, that for the tabernacle being of brass; that for the temple, of gold. Censers of various forms are still used in the Roman Catholic Church at mass, vespers, and like offices, as well as in some Anglican and other churches. A censer is usually of ornamental form, supported by chains with which it is swung to and fro by hand, the perfumed smoke issuing from the perforated top. In Shakespeare's time the term was applied to a bottle perforated and ornamented at the top and used for sprinkling perfume, or to a pan for burning any odoriferous substance.



CENSER

A characteristic type of the eighteenth century

CENSORS, *sen' sorz*, in ancient Rome, two officials whose chief duty was to take the census of the citizens and record the amount of property owned by each. Among other functions, they kept a strict watch over public and private morals, and could reduce the rank of a person or take away his right to vote if they found him guilty of immoral conduct. From the name of these Roman officials comes the English word *ensorious*, which means *fault-finding*. The censorship was created about 444 B.C., and for a century was open only to the patricians, but in 351 B.C. the plebeians secured the right of election to the office, and from their ranks came the most distinguished of all the censors, Cato the Elder (see **CATO**). During the empire, the emperors exercised the powers of the censor under the name *prefect of morals*. See **PATRICIAN**; **PLEB**-**BEIAN**.

Modern Censors. In modern usage, *censor* is applied to an officer who examines books, pamphlets, newspaper articles, etc., before they are published, to determine whether or not they contain objectionable matter, and to a similar officer who passes on plays before they are publicly presented.

[For the censorship of moving-picture displays, see **MOVING PICTURE**.]

CENSUS, an official counting of all the people of a country or section of country, which may also include statistics relating to age, place of birth, occupation, etc., and data

on a wide range of industries. In fact, the word has come to be applied to any gathering of statistics by means of direct questioning; that is, by a government enumerator who goes from house to house and obtains his information by personal interviews.

The first reliable census of a modern European nation was taken by Sweden in 1749. Most of the countries of Europe at the present time order an official counting of their population every ten years. Canada's decennial census is taken on years ending in the figure 1, as 1921, 1931; that of the United States, always one year preceding that in Canada.

The National Census of the United States. In accordance with the Constitution, the first census of the United States was taken within three years after the assembling of the first Congress, and every tenth year since then has been a census year. The first census was completed in 1790; the results were collected in a pamphlet of fifty-six pages, and the total cost was \$44,377. Seventeen marshals and 200 assistants, who carried their quill pens and ink-horns in their saddle-bags as they made their toilsome journeys through the sparsely settled country, had the work in charge.

The records that have survived from the early period show that entries were made on blanks of every conceivable size and form, for the government was too poor in those days to furnish its census-takers with uniformly ruled blanks. An enumerator of the second census (1800), who ran out of paper before he finished his work, made entries, which are yet preserved, on the back of an old periodical containing an essay by Benjamin Franklin on the *Art of Procuring Pleasant Dreams*. There are other census relics quite as interesting.

The census of 1790 made individual records only for heads of families, the members of the families being grouped as free whites, males sixteen years and over, males under sixteen years, females, other free persons, and slaves. Slowly the census broadened its field, and in 1850, after considerable experimenting, the service was put on a really informational basis. In that year, census-takers began to record every inhabitant by name, and for the first time there was a complete classification of the people according to age, sex, color, defects, etc. There were, besides, special schedules for agriculture and for leading industries.

The work was taken out of the hands of the marshals in 1880 and placed in charge of a census office at Washington. In 1902 the permanent Bureau of the Census, now a division of the Department of Commerce, was created by act of Congress.

In census-taking at the present time there are four main lines of inquiry—population, agriculture, manufactures, and mines and

quarries. The facts collected by the army of census-takers are tabulated at the Washington office, by means of remarkably ingenious electrical machines. The census reports fill over a dozen large volumes, and these are for sale at cost price by the Superintendent of Documents of the Government Printing Office, Washington D. C. Abstracts of the census for any state may be purchased in cloth binding for about one



Courtesy of Bureau of the Census

A TABULATING MACHINE

Each person in the United States whose name is recorded in the decennial census is represented in the Census Bureau by a card. On this card is printed every fact which has been developed as a result of census inquiries by trained investigators. The machine above illustrated punches holes in each card wherever the printed fact relates to the person whose name is on it.

dollar; extracts of population, agriculture, or the like, may be had in pamphlet form at prices ranging from five cents to fifteen cents.

State Census. Some of the states authorize a census every ten years; this is taken about midway between two national census years. Such a census follows the main lines of the national census, though in less detail, and special attention is paid to collecting statistics on state industries. Every year most states through their executive departments gather statistics of agriculture and mining, but these are not census returns.

Dominion of Canada. The first Federal census of the Dominion of Canada was taken in 1871, and since then an official enumeration has been taken every ten years. The work is under the supervision of the Department of Trade and Commerce. The sixth census, taken in 1921, required the services of thousands of people for months. Because of the large im-



Courtesy of Bureau of the Census

CARD-SORTING MACHINES IN THE CENSUS BUREAU

After the cards representing individuals are punched, as related in the caption under the preceding picture, they are fed into the machines shown above, where they are sorted and grouped with respect to age period, sex, color, nativity, etc. These steps are all preparatory to tabulation of population figures. Twenty-five of these machines are employed in the Census Bureau.

migrant population, the birthplace of each parent and details concerning nationality, naturalization, and date of immigration are recorded. Complete statistics are collected in regard to industries, products, occupations, and religion. In 1926, British Columbia, Alberta, and Saskatchewan took official censuses, midway in the national period. B.M.W.

CENT, *sent*, the name given to a copper coin representing the one-hundredth part of a dollar, the smallest in value in the United States monetary system. The word is derived from the Latin *centum*, meaning *one hundred*, and in slightly differing forms is applied to a small coin of most countries. The word *cent* has been in use in the United States since 1786, when Congress passed an act making the dollar of one hundred cents the basis of the coinage system. The composition and weight of the cent have been changed several times, but the coin was finally standardized in 1873, when an act was passed authorizing the coinage of one-cent pieces containing ninety-five per cent of copper and five per cent of tin and zinc, and weighing forty-eight grains. A cent is legal tender for any amount not over twenty-five cents in any one payment; if fifty pennies are offered in payment of a fifty-cent debt, the creditor may legally refuse to accept the proffer. Two-cent and three-cent coins, which have been issued at various times, are now very rare. See **BRONZE**.

The British system of coinage has been found cumbersome, with its pounds, shillings,

and pence, so Canada long ago adopted the decimal system of the United States. The British penny is equal in value to two cents, United States or Canadian; the half-penny is equivalent to one cent. Americans, in speak-



THE CENTAUR

In the Louvre, Paris. Antoine Louis Barye, sculptor (French school)

ing of their own coins, use the terms *cent* and *penny* interchangeably. Most European and South American countries have their coinage

based on the decimal system, the *cent*, *centavo*, *centesimo*, or *centime* being in each case a small coin which represents one-hundredth of a coin of larger denomination. See MONEY (Foreign Monetary Standards).

CENTAUR, *sen' tawr*, a mythical creature, half man, half horse, supposed by the ancient Greeks to live in Thessaly. Although wild and lawless, the centaurs were represented as capable of good attributes, for Chiron (which see) was one of the wisest teachers of the great Greek heroes. At one time, when a certain king was being married, the centaurs appeared at the celebration and tried to carry off the bride. The battle which ensued was one of the favorite subjects in Greek art. An interesting explanation of the centaur myth is that the early Greeks, totally unacquainted with horse-back riding, saw occasional riders come out of Thessaly and fancied that man and horse were one being. See CENTAURUS, and page 1284.

CENTAURUS, *sen tawr' us*, a constellation of the southern hemisphere which contains the earth's nearest neighbors among the stars, the Alpha Centauri group. The brightest star in the constellation, Alpha Centauri, is a double star with a dwarf companion revolving about it, and is about 4.3 light years, or 25 million

revolves. Because it is believed to be slightly nearer us than the major star, it has been named Proxima Centauri ("nearest of Centaurus"). See ASTRONOMY.

Centaurus is represented in mythology as half man, half horse, chief of the centaurs, a teacher of all the manly arts, who was accidentally killed by Hercules and placed among the stars by Jupiter. See CENTAUR. F.B.L.

CENTAVO, *sen tah' vo*, standard coin of Mexico. See MONEY (Foreign Monetary Standards); CENT.

CENTENARY COLLEGE. See LOUISIANA (Education).

CENTENNIAL EXPOSITION, a world's fair, the first international exhibition of arts, manufactures, and products of the earth held in America. This exposition was planned to commemorate the hundredth anniversary of the Declaration of Independence, and was held in the summer of 1876, in Fairmount Park, Philadelphia, the city in which the Declaration was written. Its site covered 236 acres, within which about 200 buildings were erected. Memorial Hall, used as an art gallery, was constructed in permanent form of granite, glass, and iron, and is now the Pennsylvania Museum of Art. Nearly fifty foreign governments were represented in the exhibits, and almost 10,000,000 people paid admission to the grounds.

While the exhibition showed Americans the superiority of some European products, it also opened the eyes of Europeans to the fact that a manufacturing and commercial nation was developing in America. At this fair, the Bell telephone was first exhibited.

Since the Centennial, other international exhibitions have been held in the United States, each contributing a permanent building to the city in which it was held. See WORLD'S COLUMBIAN EXPOSITION; PANAMA-PACIFIC EXPOSITION.

Sesqui-Centennial Exposition. Fifty years later a second exposition, the Sesqui-Centennial, was held at Philadelphia, and continued for six months following its opening on Memorial Day, 1926. It was financed largely by the city of Philadelphia and its citizens. The site covered about one thousand acres in the southern part of the city, and included League Island Park and the Navy Yard. The United States government appropriated \$2,186,000 for Federal participation.

The building scheme was planned to present to visitors a "Rainbow City." With the exception of the stadium, which seated 125,000, all of the buildings were of steel framework, with exteriors of stucco colored in pastel tints. The total cost of the exposition exceeded \$20,000,000, largely borne by the city of Philadelphia.

CENTENNIAL STATE, the popular name of Colorado, because it was admitted to the Union in 1876, the centennial year of the



CENTAURUS

(a) Alpha Centauri, the third brightest star in the heavens (See, also, maps of the stars, in article ASTRONOMY)

million miles, from the solar system. That is, its light reaches us about 4.3 years after it starts on its way. Alpha Centauri itself is a star of the first magnitude, and in brightness is surpassed only by Sirius and Canopus. Its dwarf companion, discovered in 1916 by the telescopic camera, is a star of the tenth magnitude. It is about one million million miles from the bright double star about which it

independence of the United States. See COLORADO.

CENTER OF GRAVITY. See GRAVITY, CENTER OF.

CENTER OF POPULATION. See UNITED STATES (Growth in Area and Population).

CENTESIMO, *sen tes' i mo.* See CENT; LIRA; MONEY (Foreign Monetary Standards).

CENTIGRADE, *sen' ti grayd*, a type of thermometer which is graduated on the scale of 100. In the Fahrenheit thermometer, the freezing point is 32° above zero and the boiling point 212°; in the Centigrade, the freezing point is zero and the boiling point 100°. The two are alike in form, and the length of tube between freezing point and boiling point does not differ; but on the Fahrenheit that length of tube is divided into 180 degrees and on the Centigrade into 100 degrees. If, therefore, it is desired to translate Centigrade readings into Fahrenheit, the number of degrees Centigrade must be multiplied by $\frac{9}{5}$, or $\frac{18}{10}$, and the product increased by 32. To change Fahrenheit to Centigrade, subtract 32 from the F. reading, and multiply the remainder by $\frac{5}{9}$. See THERMOMETER. A.L.F.

[**Derivation.** *Centigrade* is derived from the Latin words for *hundred* and *degree*. The scale was introduced in 1742 by Celsius, professor of astronomy in the University of Upsala. It is used generally by physicists.]

Problems. 1 The temperature of the air on a certain day was 90° F. at noon and 45° F. at midnight. Find the amount of change in Centigrade degrees.

$$\begin{aligned} \frac{5}{9} (F - 32) &= C \\ 90 - 45 &= 45, \text{ change in degrees F} \\ \frac{5}{9} (45 - 32) &= \frac{5}{9} \times 13 = \frac{65}{9} = 7\frac{2}{3} \end{aligned}$$

The temperature fell 7 $\frac{2}{3}$ ° C.

2 When the temperature is 25° below zero C., what is it on the F. scale?

$$\begin{aligned} \frac{9}{5} (C.) + 32 &= F \\ \frac{9}{5} \times -25 &= -45 \\ -45 + 32 &= -13 \end{aligned}$$

It is 13° below zero F. when 25° below zero C.

3 A correct F. thermometer read 68° as the temperature of a room, while an incorrect C. thermometer read 25° in the same room. What was the error of the latter?

$$\begin{aligned} \frac{5}{9} (68 - 32) &= \frac{5}{9} \times 36 = 20 \\ 25 - 20 &= 5, \text{ number of degrees the C. thermometer was in error.} \end{aligned}$$

CENTIGRADE-GRAM-SECOND. See article DYNE.

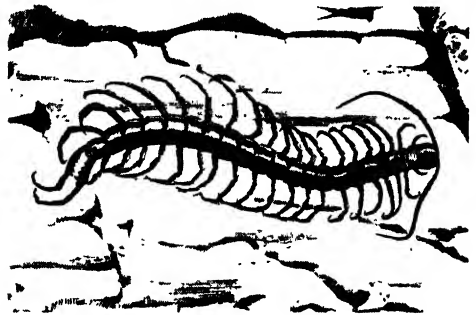
CENTIGRADE SCALE. See THERMOMETER; TEMPERATURE.

CENTIME, *sahn' teem*, a coin of France. See MONEY (Foreign Monetary Standards); CENT.

CENTIMETER, a measure of distance, equivalent to 0.3937 of an inch. It is the hundredth part of a meter, from which the metric system derives its name. The term centimeter is usually expressed by the letters *cm.* See METRIC SYSTEM; METER.

CENTIMETER-GRAM-SECOND. See articles MOMENTUM; UNIT.

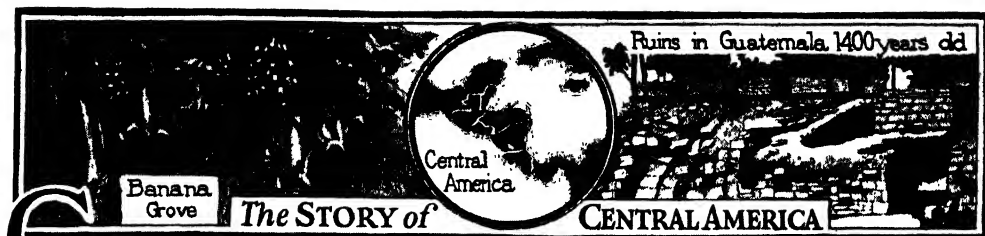
CENTIPEDE, *sen' ti peed*, the common name of an order of many-legged, wormlike creatures belonging to the subkingdom *Arthropoda* (which see). The name means *having a hundred feet*, but the number of legs varies in different forms from fifteen to over 150 pairs. Centipedes have the characteristic segmented body of the arthropods, and each segment bears one pair of legs, except the last two and



A CENTIPEDE

the one just behind the head. To the latter are attached modified legs called "poison claws." At the end of the flattened body is a head equipped with waving, jointed antennae, or feelers, a pair of mandibles, or jaws, and a pair of lower accessory jaws. Eyes are present in some species, lacking in others. The food of centipedes consists of mollusks, worms, and insects, which are killed with venom ejected into the poison claws from glands in the head. The centipede seeks its prey at night, staying under damp stones or pieces of bark by day. The smaller species found in temperate climates are harmless to man, but there are large tropical forms whose bite is fatal. Centipedes are grouped with millipedes in the class *Myriapoda* (which see). S.H.S.

CENTO, *sen' to*, a poem whose subject-matter is composed of lines or passages of one author or of several authors, without change of wording, so as to make a meaning quite different from the substance of the selected passages. The construction of such poems was quite popular at one time among the ancient Greeks, but even more so among the Romans in the days of the empire. In the Middle Ages, poems of this nature attracted much attention; in the twelfth century a monk named Metellus produced a hymn from the poetry of Vergil and Horace



CENTRAL AMERICA. This tropical land mass, connecting North America and South America, consists of the republics of Guatemala, Honduras, Salvador, Nicaragua, Costa Rica, and Panama, and the colony of British Honduras. Lying between the Atlantic and the Pacific, it stretches from Mexico to Colombia, and has an area of about 187,000 square miles. Its population of about five and one-half millions is composed largely of native Indians, Mestizos, and Spaniards.

The Central American states are yet in a backward condition; the entire area attracted only casual attention from the rest of the world until plans for connecting the Atlantic and Pacific oceans by a great ship canal across Panama brought the countries of Central America into greater prominence commercially.

Physical Features. Central America presents a variety of scenery and climate as one progresses from the low Atlantic coastlands inland and upward to the central plateau region, bounded on the west by a range of mountains rising to great heights along the Pacific and forming a part of the great mountain system which runs continuously throughout the length of two continents, North and South America. The mountains are rich in many minerals, such as gold, silver, and copper, as yet scarcely touched by mining projects. Volcanoes are numerous in this region, and earthquakes are common; ruins show where more than one city has been destroyed by them. The highest peak in the region rises 13,800 feet above the sea. On the west, the coast in most places drops abruptly to the water, presenting a gloomy and frowning appearance, viewed from the Pacific, but stretching back from the Atlantic seaboard are hot, moist plains covered with dense tropical forests, except where the great banana and sugar plantations have been introduced.

The climate in the uplands of the interior is temperate, and here live the majority of the population. The chief staple, coffee, is grown on the mountain

slopes of these regions. The lowlands are damp and unhealthful, often fever-stricken, which accounts in a measure for the backwardness of the states, for Europeans and Americans have not cared to risk their lives to establish industries; but the wonders that have been accomplished in the Canal Zone in Panama show what may some time be done to make even the damp coast regions healthful, by the extermination of the fever-carrying mosquitoes. Great fruit companies of the United States have already transformed much of the malarial swamp land into productive banana plantations.

History. Interest in Central America lies in the far-distant past and immediate present. The intermediate period is colorless. The remote past of much of this territory was noteworthy. Here, long before the first white man visited the country, there grew up a civilization unmatched elsewhere in the western hemisphere. The Maya Indians had built for themselves great cities and monuments which are fit to rank with the pyramids of Egypt; they had worked out a calendar, and had invented a method of writing. All this, scholars believe, happened as long ago as the fifth or sixth century A.D., and by the time Europeans reached the coasts, the civilization as well as the cities had fallen into decay and the Indians had forgotten the meaning of progress. Of recent years, much interest has been shown in the remains of this old culture.

The modern history of Central America begins in 1502, when Columbus first sighted its shores. A dozen years later, a Spanish adventurer conquered a part of the present Costa Rica, and in 1524 Pedro de Alvarado succeeded in gaining control over most of Guatemala and Salvador. The great Spanish conqueror, Cortez, entered the country in 1525, and overcame the tribes that had held out until then. For almost three centuries from that date Central America formed the Spanish captaincy-general of Guatemala, but in 1821 the Spanish rule was brought to a close by a



Photo U & U
A TYPE OF CENTRAL AMERICAN
PEASANT WOMAN



Photo U & U

MOST VILLAGE STREETS ARE MUCH LIKE THIS ONE

revolution. The newly independent territory was at once divided into the five states of Costa Rica, Guatemala, Honduras, Salvador, and Nicaragua, which for a brief time were a part of the empire of Mexico. In 1823 they freed themselves, and became the Republic of the United States of Central America, but the union lasted only sixteen years. Since that time, various efforts have been made to form another union, sometimes by force of arms, but the governments in the single states have always been too unstable for any one of them to assume a firm leadership. By colonization, Great Britain gained a hold in the country during the nineteenth century, establishing British Honduras, and in 1903 another state, Panama, was added to the number of republics.

Almost incessant wrangling within and among the states has retarded progress, but the Washington Peace Conference of 1907 was the beginning of a period of diminishing interstate friction. A Central-American Court was established, and it has been very successful in arbitrating troubles between states. In 1921 the five republics formed a union to be known as the *Central American Federation*, with a Constitution patterned largely after that of the United States, carefully defining the relations and functions of Federal and state governments. It was dissolved in 1922.

In 1923 representatives of the five republics met at Washington, D. C., and drew up a general treaty of peace and friendship providing for limitation of arms and diplomatic settlement of controversies, and the establishment of a tribunal to which fifteen United States citizens

may be appointed, known as the Central American Union.

A direct method of securing closer union among the republics is under way in the construction of a Central American International Railway from Mexico to Panama and eventually South America, linking the republics.

Related Subjects. The following articles, if read in connection with the above, will give a more detailed knowledge of Central America

British Honduras
Colon
Cortez, Hernando
Costa Rica
Guatemala
Honduras
Maya
Mosquito Coast

Nicaragua
Nicaragua, Lake
Nicaragua Canal
Panama (city)
Panama, Isthmus of
Panama, Republic of
Panama Canal
Salvador

CENTRAL AMERICAN FEDERATION.

See CENTRAL AMERICA.

CENTRAL AUSTRALIA, a new political division of the Commonwealth of Australia, set apart in 1928. Formerly it was the southern half of the vast Northern Territory; the northern half is now North Australia. By the organization of these two new political units, the central part of the continent from north to south comprises North Australia, Central Australia, and the older division, South Australia.

The dividing line between North and Central Australia is at latitude 20° S. In Central Australia there are so few people that there is not an average of one to the square mile. See AUSTRALIA.

CENTRAL EXPERIMENT FARM. See AGRICULTURAL EXPERIMENT STATIONS (Canada).

CENTRAL AMERICA

ADJACENT WATERS

Caribbean Sea.....	E
Caxones or Hobbies.....	E
Cayos de Albuquerque.....	F
Courtown Cays.....	F
Gorda Bank.....	F
Half Moon Reefs.....	F
Hobbies or Caxones.....	E
Misteriosa Bank.....	E
Mosquito Bank.....	E
Mosquito Cays.....	F
Old Providence Island.....	F
Pacific Ocean.....	A
Quita Suena Bank.....	F
Roncador Bank.....	G
Saint Andrews Island.....	F
Serrana Bank.....	F

BRITISH HONDURAS

(Belize)

Alt Pines, 57.....	C
Amatique, Gulf of.....	B
Ambergris Cay.....	C
Belize (capital), 12,423.....	C
Chetumal Bay.....	C
Cockscomb Mountains.....	B
Corosal, 2,069.....	B
Estevan, 554.....	C
Hondo River.....	B
Lighthouse Reef.....	C
Long Cay.....	C
Old River.....	B
Orange Walk, 1,175.....	B
Punta Gorda, 922.....	B
Stann Creek, 2,577.....	B
Turneffe Island.....	C

COSTA RICA

Alajuela, 8,611.....	E
Blanco, Mount.....	E
Burica Point.....	E
Cano Island.....	E
Carrillo.....	E
Cartago, 7,195.....	E
Chirripo, Mount.....	E
Coronada Bay.....	E
Culebra Gulf.....	D
Dulce, Gulf of.....	L
Elena, Cape.....	D
Esparita, 2,093.....	E
Grande de Terraba, Rio.....	E
Heredia, 7,754.....	E
Irazu Volcano.....	E
Liberia, 3,230.....	D
Limon, 15,690.....	E
Llorenzo Point.....	E
Matapalo, Cape.....	E
Nicoya, 4,322.....	D
Nicoya, Gulf of.....	E
Nicoya Peninsula.....	D
Orosi Volcano.....	D
Puntarenas, 7,848.....	E
Punto Uvita.....	E
Reventazon.....	E
Reventazon River.....	E
San Jose (capital), 51,489.....	E
San Juan River.....	E
Santa Cruz, 1,690.....	D
Telir River.....	E
Velas, Cape.....	D

GUATEMALA

Ajutla.....	A
Amates.....	B
Amatique, Gulf of.....	B
Amatitlan, 7,002.....	A
Antigua, 11,184.....	A
Antigua, Lake.....	A
Champerico, 1,564.....	A
Chiquimula, 19,961.....	B
Chixoy River.....	A
Coban, 26,774.....	A
Dolores, 339.....	B

Dulce, Gulf (Lake

Isabal).....	B
Escuintla, 21,840.....	A
Flores, 1,801.....	B
Fuego Volcano.....	A
Gualan, 13,293.....	B
Guatemala (capital), 115,938.....	A
Guizal, Lake.....	B
Huehuetenango, 9,513.....	A
Istapa, 483.....	A
Izabal, 1,648.....	B
Izabal, Lake (Gulf Dulce).....	B
Jalapa, 15,448.....	B
La Libertad, 1,610.....	A
Livingston, 5,154.....	B
Mazatenango, 11,319.....	A
Michatoya River.....	A
Motagua River.....	B
Ocos, 1,554.....	A
Panzos, 3,544.....	B
Pasion River.....	B
Peten, Lake.....	B
Puerto Barrios, 2,601.....	B
Quezaltenango, 30,125.....	A
Retalhuleu, 14,301.....	A
Salama, 13,548.....	A
San Augustin.....	A
San Jose, 1,500.....	A
San Marcos, 6,029.....	A
San Pedro River.....	A
Santa Cruz Quiche, 17,073.....	A
Santa Rosa, 3,738.....	B
Solola, 11,319.....	A
Tecpan Guatemala, 9,219.....	A
Tical.....	B
Tonicanpan, 29,970.....	A
Tres Puntas, Cape.....	B
Tucuru.....	B
Usumacinta River.....	A
Zacapa, 18,094.....	B

HONDURAS

Aguan River.....	D
Amapala, 2,467.....	C
Bay Islands.....	C
Bonacca Island.....	D
Brewer Lake.....	E
Cameron, Cape.....	E
Caratagua Lagoon.....	E
Catacamas, 5,680.....	E
Cedros, 7,942.....	C
Chamelecon River.....	C
Choluteca, 9,579.....	C
Choluteca River.....	C
Coco River.....	E
Colon Mountains.....	E
Comayagua, 9,298.....	C
Danli, 6,344.....	D
Dipilto Mountains.....	D
Fonseca, Gulf of.....	C
Gracias, 4,926.....	B
Honduras, Cape.....	D
Honduras, Gulf of.....	C
Intibuca, 3,844.....	C
Irona, 5,144.....	D
Jutigalpa, 8,576.....	D
La Brea.....	C
La Ceiba, 9,879.....	C
La Esperanza, 1,464.....	B
La Paz, 4,561.....	C
Nacaome, 5,571.....	C
Negro River.....	D
Ocotepique, 5,594.....	B
Olanchita, 7,227.....	C
Ormoa, 2,943.....	C
Patuca, Point.....	E
Patuca River.....	E
Pespire, 6,512.....	C
Pija Mountains.....	C
Potrilleros, 1,260.....	C
Puerto Cortez, 7,154.....	C

Roatan Island.....

San Lorenzo, 1,046.....	C
San Pedro, 13,974.....	C
Santa Barbara, 4,353.....	B
Santa Rosa, 9,551.....	B
Santiago River.....	B
Segovia or Wanks River.....	E
Sulaco River.....	C
Tegucigalpa (capital), 25,986.....	C
Tela, 4,904.....	C
Trinidad, 4,391.....	C
Trujileo, 2,849.....	D
Ulua River.....	C
Utila Island.....	C
Yojoa, Lake.....	C
Yoro, 7,074.....	C
Yuscaran, 3,623.....	C

NICARAGUA

Acayapa, 724.....	D
Bluefields, 5,068.....	D
Bluefields River.....	E
Boaco, 1,407.....	D
Brito.....	D
Chichigalpa, 3,225.....	C
Chinandega, 10,780.....	C
Corinto, 1,396.....	C
Coseguina Volcano.....	C
Cuicuina.....	E
Dipilto Mountains.....	D
El Viejo (volcano).....	C
Esteli, 2,809.....	C
Fonseca, Gulf of.....	C
Gracias a Dios, Cape.....	E
Gracias a Dios, Cape.....	E
Granada, 16,763.....	D
Grande, Rio (river).....	E
Great Corn Island.....	E
Greytown (San Juan del Norte), 598.....	E
Gursil Volcano.....	D
Jinotega, 2,422.....	D
Jinotega, 4,291.....	C
La Picara (mountain).....	E
La Virgen.....	D
Leon, 38,318.....	C
Libertad, 1,636.....	E
Little Corn Island.....	E
Managua (capital), 27,839.....	C
Managua, Lake.....	D
Masaya, 13,258.....	C
Matagalpa, 4,471.....	D
Matina Bay.....	E
Momotombo.....	C
Monkey Point.....	E
Muyruy, 299.....	D
Nicaragua, Lake.....	D
Ocotat, 1,418.....	D
Omotepe Island.....	D
Papagayo Gulf.....	D
Pearl Lake.....	E
Posoltega, 827.....	C
Prinzapolka, 392.....	E
Prinzapolka River.....	E
Rivas, 3,026.....	D
San Carlos, 703.....	E
San Juan del Norte (Greytown), 598.....	E
San Juan del Sur, 707.....	D
San Juan River.....	E
Sebaco, 303.....	D
Segovia or Wanks River.....	E
Somoto, 1,217.....	C
Tuma River.....	E
Wanks or Segovia River.....	E
Wassel.....	E
Wounta.....	E
Yolaina Mountains.....	E

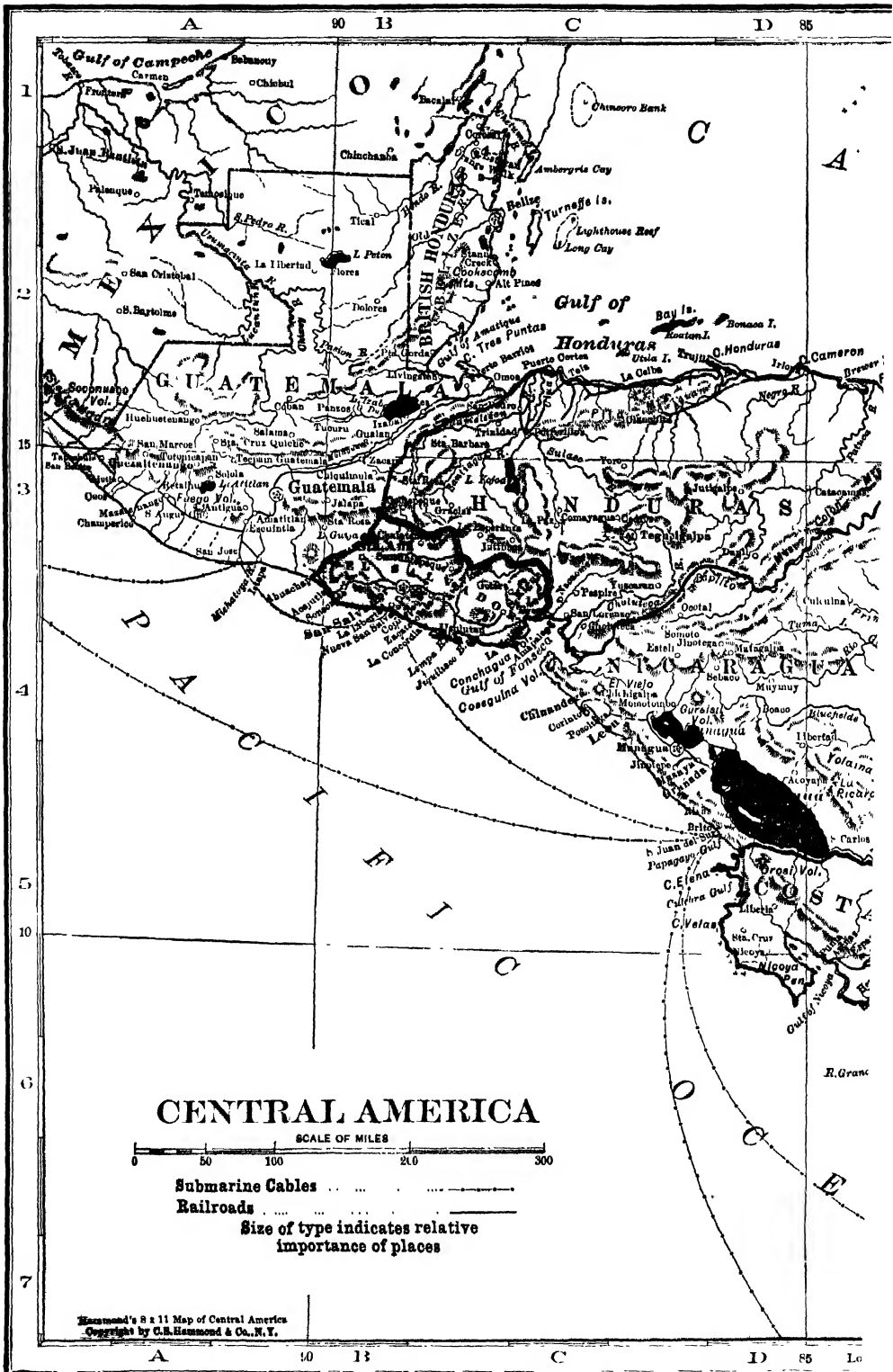
PANAMA

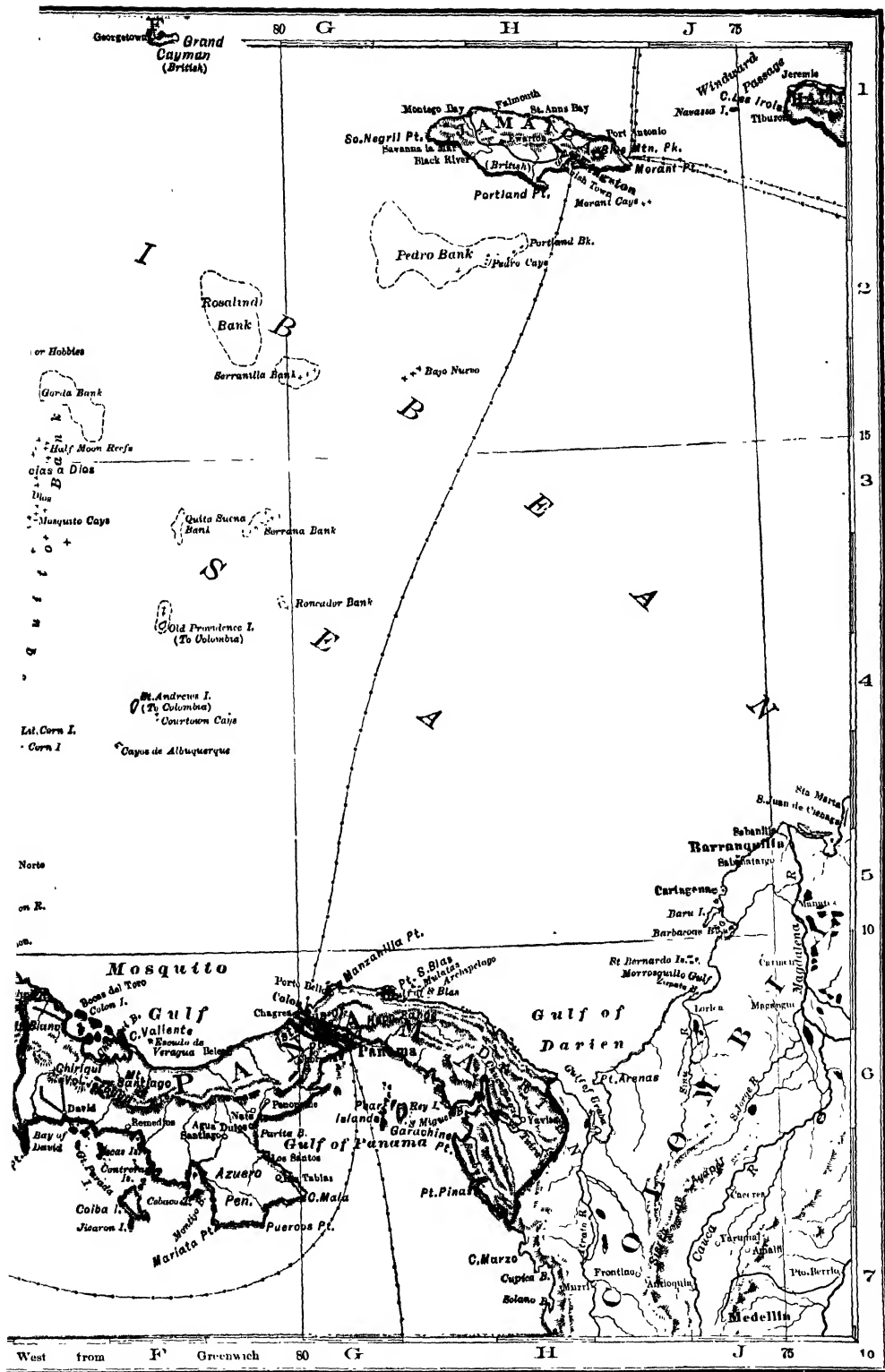
Agua Dulce, 2,075.....	F
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Azuero Peninsula.....	F
Belen.....	F
Bocas del Toro, 3,018.....	F
Burica Point.....	E
Cebaco Island.....	F
Chagres.....	F
Chiriqui Bay.....	F
Chiriqui Volcano.....	F
Chorrera, 2,033.....	G
Chucumague River.....	H
Coiba Island.....	F
Colon, 31,203.....	G
Colon Island.....	F
Contreras Islands.....	F
Darien.....	H
Darien, Gulf of.....	H
David, 5,598.....	F
David, Bay of.....	E
Escudo de Veragua.....	F
Garachine Point.....	F
Great Parada Island.....	F
Hepo Range.....	G
Jicarón Island.....	F
Las Tablas, 2,635.....	F
Los Santos.....	F
Mala, Cape.....	G
Manzanilla Point.....	G
Mariata Point.....	F
Montijo Bay.....	F
Mosquito Gulf.....	F
Mulas Archipelago.....	G
Nata.....	F
Panama (capital), 59,458.....	G
Panama, Gulf of.....	G
Panama, Isthmus of.....	G
Parita Bay.....	F
Pearl Islands.....	G
Penonome, 2,677.....	F
Pinas, Point.....	H
Porto Bello.....	G
Puerco Point.....	F
Remedios.....	F
Rey Island.....	G
Sambu River.....	H
San Blas, Gulf of.....	G
San Blas, Point.....	G
San Miguel Bay.....	H
Santiago, 1,617.....	F
Santiago, Mount.....	F
Secas Islands.....	F
Telir River.....	E
Tuira River.....	H
Valiente, Cape.....	F
Veragua Mountains.....	F
Yavisa.....	H

EL SALVADOR

Acacutla, 1,150.....	A
Ahuachapan, 31,249.....	A
Chalatenango, 11,986.....	B
Cojutepeque, 17,041.....	B
Conchagua Volcano.....	C
Fonseca, Gulf of.....	C
Gotera.....	C
Guizal, Lake.....	B
Iquilesc Bay.....	B
La Concordia.....	B
La Libertad, 2,785.....	B
La Union, 7,402.....	C
Lempa River.....	B
Nueva San Salvador, 28,924.....	B
San Miguel, 37,839.....	C
San Salvador (capital), 88,058.....	B
Santa Ana, 74,827.....	B
San Vicente, 34,127.....	B
Sensuntepeque, 22,290.....	B
Sonsontate, 16,703.....	B
Usulután, 18,454.....	B
Zacatecoluca, 33,876.....	B





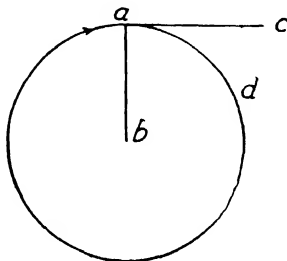
CENTRAL FALLS, R. I. See RHODE ISLAND (back of map).

CENTRALIA, ILL. See ILLINOIS (back of map).

CENTRAL STATE. See KANSAS.

CENTRAL TIME. See STANDARD TIME.

CENTRIFUGAL, *sen trif' u gal*, **FORCE.** According to the law of inertia (which see), any moving body tends to move in a straight line. The resistance which a moving body offers to the force compelling it to move in a circular path is called *centrifugal force*. Centrifugal means *flying from the center*; the force which is exerted against centrifugal force is called *centripetal*, which means *center-seeking*. A common illustration of the effects of centrifugal force is mud flying from a swiftly turning automobile wheel. In this case the force directed toward the center (manifested by adhesion of the particles to the tire) is overcome by the resisting, or centrifugal, force, and the mud flies off from the tire along a tangent (see illustration). For the same reason drops of water fly off from a turning grindstone. It is centrifugal force that keeps water from spilling out when a pail of water is whirled around one's head.



CENTRIFUGAL FORCE

Illustrating a stone at (a) tied to a string (ab). When the stone is at (a), revolving around (b), it is traveling toward (c), but the string is pulling toward (b), hence the stone must take the resultant path (ad). See COMPOSITION OF FORCES.

Centrifugal force is utilized in many ways in industry. The cream separator, the centrifugal drier used in laundries, the machine employed in sugar refineries to separate sugar crystals from syrup, the honey-extracting machine, and the centrifugal pump all make use of the principle that a moving body resists the force compelling it to move in a circular path. See CENTRIPETAL FORCE.

A.L.F.

Problem. Centrifugal force may be expressed mathematically by the equation $F = \frac{M}{g} \times \frac{V^2}{R}$, in

which M = mass, g = acceleration of gravity, V = velocity, and R = radius. (The value of the acceleration of gravity (g) averages about 32.2 feet-per-second per second.)

1. A mass of 8 pounds attached to the end of a string is being whirled in a circle with a radius of 4 feet, with a constant velocity of 12 feet per second. What is the pull on the string, or the centrifugal force?

SOLUTION

$$F = \frac{M}{g} \times \frac{V^2}{R}$$

$$F = \frac{8}{32.2} \times \frac{12^2}{4} = \frac{8}{32.2} \times \frac{144}{4} = 8.94, \text{ number of pounds of force}$$

2. A stone weighing 6 pounds is whirled in a circle by means of a cord 5 feet long. The cord breaks, and the stone flies off with a velocity of 25 feet per second. What pull was exerted on the string when it broke?

$$F = \frac{6}{32.2} \times \frac{25^2}{5} = ?$$

3. A mass moving in a circular path of 3 feet radius makes 6 revolutions per minute. A force of 2 pounds is needed to keep the mass from leaving the circular path. What does the mass weigh?

SOLUTION

Here we have F given, to find M .

The velocity is found from the formula for ascertaining the circumference of a circle, $\text{circum} = 2\pi R$ (see CIRCLE), π being 3.1416

$$2 \times 3.1416 \times 3 \text{ feet} = 18.8496 \text{ feet, circumference.}$$

$$6 \text{ revolutions per minute} = \frac{1}{10} \text{ revolution per second.}$$

Thus the mass moves $\frac{1}{10}$ of 18.8496 feet each second, or 1.88 feet.

$$\frac{M}{32.2} \times \frac{1.88^2}{3} = 2.$$

$$\frac{3.53 M}{96.6} = 2$$

$$3.53 M = 193.2$$

$$M = 54.47, \text{ weight of mass in pounds.}$$

[While the centripetal and centrifugal forces are always equal, and the same formula is used to determine their values, it should be noted that these forces are very different in character. The centripetal force is a real force exerted on a body from outside the body. The centrifugal force is merely a reaction exerted by any body in motion when one tries to change the direction of the motion (see CENTRIPETAL FORCE).]

CENTRIPETAL, *sen trip' e tal*, **FORCE**, the force that compels a body to move in a circular path, with acceleration toward the center. It is the force that acts in opposition to *centrifugal force* (which see). In the case of a turning grindstone, the centripetal, or center-seeking, force acts to keep the stone in a circular path, while centrifugal force is exerted to counteract the direction of its motion. If the stone is run at too high a speed, the centripetal force (represented by the cohesive force that holds the particles together) is overcome, and the stone flies to pieces. When an automobile speeds around a curve, centripetal force is represented by friction between the tires and the road. If the speed is so great that the centrifugal force overcomes the centripetal, the automobile skids. Gravity is considered to be the great centripetal force of the earth. Were it not for this, the rapid rotation of our planet at the equator would cause all bodies on its surface to fly off into space in straight lines.

A.L.F.

CENTROSPHERE, *sen' tro sfee'r*. See GEOLOGY (Structure of the Earth); EARTH (Parts of the Earth).

CENTURY COLLEGE. See LOUISIANA (Education).

CENTURY PLANT, OR **AGAVE**, *a ga' ve*. *Agave* is the true name of a genus of desert plants belonging to the *amaryllis* family. These are commonly called century plants because one well-known species, the *American century plant*, has been popularly supposed to bloom but once in a hundred years. Some species of *Agave* flower every year, and others at infrequent intervals. The American century plant blooms rather late in life, though it does not wait until it is a century old. Specimens are often seen in greenhouses and gardens. When the time for flowering approaches, a tall stem springs from the center of a tuft of fleshy, spiny-edged leaves and grows very rapidly until it reaches a height of fifteen, twenty, or even forty feet. Numerous white or greenish flowers are borne toward the end of the stalk. Then the leaves, having given their store of nourishment to the production of this large stalk and its flowers, droop and die, but the roots soon send up new shoots for the new generation.

The sap of some of the species, when fermented, yields an intoxicating beverage resembling cider, called by the Mexicans *pulque*. From others is produced the familiar *mescal*, another intoxicating drink of the Mexicans. The leaves are used as fodder, and their fibers are also formed into thread, cord, and ropes. An extract from the leaves is used as a substitute for soap. Slices of the withered flower stem are used as razor strops. See ALGAE.

G.M.S.

Scientific Names. The genus belongs to the family *Amaryllidaceae*. The American century plant is *Agave americana*.

CEPHALOCHORDATA, *sef a loh kawr dah'-tah*. See ZOÖLOGY (Divisions of the Animal World).

CEPHALOPODA, *sef a lop' o dah*, the name of a class of mollusks which includes the cuttlefish, the octopus, the nautilus, and the

squid, all of which are described under their titles. The name means *head-footed*, and is given these animals because they have a number of arms, the so-called feet, around the mouth. The arms usually have little cups, or "suckers," on the under side, which enable the animal to fasten itself securely to its prey. See MOLLUSKS.

S.H.S.

CEPHALOTHORAX, *sef- a lo tho' raks*. See SCORPION.

CEPHALUS, *sef' a lus*, one of the lovers of Aurora, goddess of the dawn. See AURORA.

CEPHEIDS, *sef' e idz*. See STAR (Variable Stars).

CEPHEUS, *se' fuse*, or *se' fe us*, a mythological king of Ethiopia. See ANDROMEDA.

CEPHISSUS, *sef' i sus*, husband of Leiriope, and father of Narcissus (which see).

CERAMIC, *se ram' ik*, ART. See POTTERY.

CERBERUS, *sur' be rus*, in Greek and Roman myths, Pluto's three-headed dog, the grim guardian of the entrance to the underworld. His jaws dripped with foam, from which, it was declared, sprang the deadly nightshade. Early and late he kept his watch, allowing no living being to enter the gates of Hades, nor any spirit to pass out of them. Orpheus, however, searching for his wife Eurydice, played such melting strains on his lyre that Cerberus was

won over and permitted him, though a mortal, to enter the realms of Pluto.



THE CENTURY PLANT



REPRESENTATIONS OF CERBERUS

(a) Hercules capturing Cerberus. (From a vase painting.)

(b) A bronze Cerberus dating from ancient times, now in the Vatican Museum, Rome.

The last of the twelve labors of Hercules was his descent into Hades to secure the savage

Cerberus. Hercules speedily accomplished this fearful task, but when he brought the triple-headed monster to Eurystheus, at whose command the deed was performed, the latter fled in terror, and taking refuge in a huge jar, would not come out of his hiding place until Hercules had been persuaded to carry the dog back to Hades.

Related Subjects. The reader is referred in these volumes to the following articles:

Hercules
Nightshade

Orpheus
Pluto

CEREALIA, *se re a' li ah*, a Roman festival. See CERES.

CEREALS, *se' re alz*. See GRAINS.

CEREBELLUM, *sehr e bel' um*. See BRAIN.

CEREBRAL HEMORRHAGE, *sehr' e brahl hem' o rayj*. See APOPLEXY; MENINGITIS.

CEREBRUM, *sehr' e brum*. See BRAIN.

CERES, *se' reez*, in ancient mythology, a Roman goddess who protected and watched over the fruits of the earth, and especially the grains. She was the daughter of Saturn and Rhea and mother of Proserpina (in Greek, Persephone). According to the interesting myth, when her daughter was stolen and carried off to Hades, Ceres neglected the earth during her search for Proserpina, and all vegetation died. The Romans built temples and celebrated the festival of the *Cerealia*, in honor of Ceres. The sacrifices made to her consisted of pigs and cows. Ceres was usually represented in full attire, holding ears of corn and a lighted torch, and with poppies, her sacred flower. The Greeks worshiped the goddess under the name *Demeter*. The earliest plane-toid known was named Ceres, according to the customs of giving stars and constellations names taken from mythology. See PROSERPINA; RHEA; in astronomy, see ASTEROIDS.

CEREUS, *se' re us*. See CACTUS.

CERIUM. See CHEMISTRY (Elements).

CERRO GORDO, *sehr' o gawr' doh*, BATTLE OF. See MEXICAN WAR.

CERTIFIED MILK. See ADULTERATION OF FOODSTUFFS AND CLOTHING; BABY (Feeding).

CERTIFIED PUBLIC ACCOUNTANT. See ACCOUNTANCY.

CERUSSITE, *se' ru site*. See CARBONATES.

CERVANTES SAAVEDRA, *thehr vahn' tays sah ah vay' drah*, MIGUEL DE (1547-1616), universally acknowledged to be the greatest of Spanish novelists, rich in imagination and keen of wit—the author of *Don Quixote*, a book translated into nearly all the languages of the world. This very interesting book is described in these volumes under its title. The early life of the author is not known in much detail. It is certain that he was born in Alcala de Henares, of pure Castilian stock, but his education is largely a matter of conjecture. Early in his career he joined the army, for there is record of the gallant part he played in the Battle of Le-

panto (1570), at which Turkish power in Europe received a severe blow. There is further record of his experiences as a soldier and of his capture in 1575 by a band of pirates. For five years, he bore with praiseworthy fortitude the hardships of prison life, being finally ransomed through the efforts of friends.

Returning to Spain, Cervantes married and began seriously to devote himself to literature. He published some sonnets in 1583, and two

years later a pastoral novel, *Galatea*, gained for him considerable notice. Following this appeared a long list of plays—from twenty to thirty or more—but he was not successful as a dramatist, and for a time lived in very straitened circumstances. Only a few verses came from his pen between the period of dramatic writing and his emergence as the



CERVANTES

author of *Don Quixote*. The first part of this book was published in 1605; ten years later part two appeared. Though the work was received with every evidence of popular favor, it brought the author scant financial re-



INNER COURT OF CERVANTES' HOME.

It was in this building that *Don Quixote* was written.

turns. Second only to his masterpiece is a little volume of twelve *Exemplary Tales*, published in 1613. Even had there been no *Don Quixote*, these stories would have given him high rank as a novelist. He continued his literary work until the last year of his life, among his later writings being a review of contemporary poets (in rhyme), entitled *Journey to Parnassus*.

CERVICAL VERTEBRAE, *sur' vi kal vur' te-bre*. See SKELETON.

CETACEA, *se ta' she ah*, OR **CETACEANS**, an order of large marine animals, including the whales, dolphins, and porpoises. They are true mammals, with warm blood, and they breathe by means of lungs (see **MAMMALS**). But in becoming used to life in the water, their bodies, outwardly and inwardly, have assumed much of the form and structure of fish. The body ends in a tail which is expanded into two horizontal lobes. There are no external hind limbs, and the fore limbs are broad paddles, or flippers, enclosed in a continuous sheath of thick skin. The fishlike appearance is further increased by a fin on the back, but this is a simple fold of skin and does not contain bony spines. The smallest cetaceans are three to four feet in length; the largest, eighty-five feet.

Whalebone whales have no teeth in the full-grown state, but, instead, have triangular plates of baleen, or whalebone, which are developed on ridges across the palate. Sperm whales, dolphins, and porpoises belong to a suborder of toothed sea mammals. The nostrils of cetaceans open directly upward on the top of the head and are closed by valves of skin, which are under the control of the animal. When a cetacean comes to the surface to breathe, it blows the air out violently, and the vapor it contains, becoming condensed into a cloud, resembles a column of water and spray. L.H.

Related Subjects. For a detailed discussion of the various cetaceans, the reader may consult the following articles:

Dolphin	Narwhal	Rorqual
Grampus	Porpoise	Whale

CETEWAYO, *set a wah' yo*, a Zulu king. See **ZULULAND**.

CETTINJE, *tset' en ya*. See **YUGOSLAVIA** (Principal Cities).

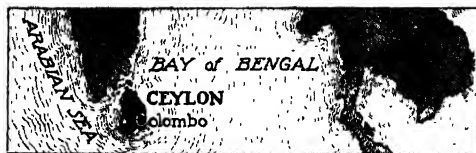
CEVENNES, *sa ven'*, a mountain system of Southern France, running northeast from the most northerly hills of the Pyrenees for a distance of 320 miles. The highest peak in the whole system is Mezenc, 5,755 feet above sea level, but the average altitude is not more than 3,000 feet. On the fertile lower slopes of the mountains, large crops of grain, fruit, and vegetables are raised. In many localities, mulberry trees are cultivated for their leaves, upon which silkworms feed. The mountains have been the scene of much warfare, and at various times have furnished shelter for the persecuted Waldenses, Albigenses, and Camisards. In the Vosges Mountains, a northern extension of the Cevennes system, some of the fiercest fighting of the World War took place.

CEYLON, *se lon'*. The romance of this large island in the Indian Ocean has been felt by thousands who know little more about the island than is contained in those lines of Heber's famous hymn—

..... the spicy breezes
Blow soft o'er Ceylon's isle,
Where every prospect pleases
And only man is vile.

Someone, impressed by its natural beauty, called it the "Pearl of the Orient," and the name clings

Ceylon lies fifty-five miles southeast of the extreme southern point of the peninsula of India, being separated from it by the shallow Palk



LOCATION MAP

Strait, and is a part of British India. The island is pear-shaped, 271 miles in extent from north to south and 137 miles in greatest width, with an area of 25,281 square miles. It is therefore about five-sixths as large as Ireland or the state of South Carolina. The surface is very mountainous in the interior, with a low-lying coast line of coral reef. The most noted mountain is Adams Peak (7,420 feet), to which Buddhists make religious pilgrimages.

People and History. Ceylon, like India, is a very ancient land, its authentic history beginning in the sixth century B.C.; it contains some of the most remarkable ruins in the world. The island is also one of the chief centers of Buddhism; the Buddhists number 2,750,000; there are 440,000 Christians. 980,000 Hindus, and 302,000 Mohammedans. The native inhabitants are the Singhalese, who have lived here many centuries. They are Buddhists and a gentle and peaceable, but effeminate, people. The men have the curious custom of dressing somewhat like women.

Europe entered into Ceylon's history by the invasion of the Portuguese in 1505, of the Dutch in 1636, and of the British in 1795. In 1831 the entire island consented to British rule and became a crown colony of the empire, having a governor appointed in London; each of its nine provinces was placed under a government agent. It is now one of England's most prosperous colonies. Its population is over 4,504,000, about three-fourths Singhalese; others are Hindus, Mohammedans, and Europeans. Colombo (see below) is the capital and one of its three great harbors, the others being Galle and Trincomalee, the latter one of the finest in the world. There are 600 miles of railroad, and excellent automobile roads.

Colombo, the capital and chief seaport, is an important commercial city, situated on the west coast. It is the center of the island's tea and coconut trade. The native and the white sections are widely different;



Photos. Keystone; Wide World; U & U

In Far-Away Lovely Ceylon. The jinrikisha is yet the popular "taxicab" of the island. Little black boys after coconuts; with a cloth joining their ankles, they climb with great speed. The lower picture is a rice-harvesting scene.

the former has narrow, ill-kept streets, while the latter has fine buildings, good roads, and beautiful trees and gardens.

Colombo's age is not known. Under a native name it was known in 1345, and it was then the most notable settlement in India. The Dutch held it from 1656 to 1795, when it fell to the English.

Vegetable and Animal Life. Ceylon is a tropical island, situated between 6° and 10° north of the equator. Its climate is hot on the coast, but cool and delightful in the uplands, where white residents build their homes. Agriculture is the chief occupation. The coconut palm, breadfruit, plantain, cinnamon, mango, and bamboo abound, while there are plantations of tea, rice, coffee, and tobacco. Over 457,000 acres of land are devoted to the tea plantations, while more than 644,000 acres are cultivated for rice. The bo-tree, banyan, ebony, and satinwood trees grow in the forests, while the cinchona tree is cultivated for its bark, from which quinine is made. There are gold, graphite, and precious stones in the mountains and pearl fisheries on the coast.

The most important agricultural feature is the cultivation of the tea plant. Its growth has been truly marvelous. In 1873 the export of tea was only twenty-three pounds; this has increased to 200,000,000 pounds per year. More than one thousand plantations, chiefly in the mountains, employ about 400,000 people, most of whom come over from India, where employment is difficult to find. See TEA.

Animal life is very abundant, there being innumerable varieties of birds and insects and many larger animals. Of the latter, the elephants are the largest and most numerous, several thousands of them roaming wild through the forests. Large numbers are tamed, and make valuable beasts of burden. Many of the tame elephants in India come from Ceylon, the remainder from Burma. The Ceylon elephant does not have the long ivory tusks for which the African elephant is hunted.

CHACABUCO, BATTLE OF. See SAN MARTIN.
CHACALACHA, chah kah lah' kah. See GUAN.

CHACMA, chak' mah. See BABOON.

CHACO, chah' ko, a vast plain in Paraguay. See PARAGUAY (Physical Features).

CHACO CANYON. See MONUMENTS, NATIONAL; NEW MEXICO (National Monuments).

CHAD, chahd, also spelled TCHAD, a large lake lying between the Sudan and the Sahara Desert of North Africa. Within recent years, it has greatly shrunk in size, but it is still a very large volume of water, covering an area from 10,000 to 40,000 square miles, in dry and wet seasons. In certain sections, towns normally on its shores in wet periods may be twenty miles away from the water after rains cease. Its tributary rivers periodically bring great floods of water to its basin. Although

the lake is supposed to have been known to the ancients and was referred to by Ptolemy, it was first visited by white people in 1823. There are many islands, most of them inhabited by bands of marauders who live by pillaging the native tribes living on the shores. The territory at the eastern end of the lake is fertile; that on the west is a desolate, sand-strewn desert.

CHADWICK, GEORGE WHITEFIELD (1854-), considered by critics the most important American musical composer, with the exception of MacDowell. Born in Lowell, Mass., he received his early musical education in America, but later studied with the best European masters. Returning to Boston in 1880, he entered the New England Conservatory as instructor, and later became director. After 1897 he conducted the annual music festival at Worcester, Mass.

His Work. Chadwick's compositions include the oratorio *Judith*, the music for the *Columbian Ode* (sung at the opening of the World's Fair in Chicago), symphonies, choruses, chamber music, songs, and pieces for the piano and organ.

CHAEERONEA. See GREECE (History).

CHAFFINCH, chaf' inch, a handsome European songster belonging to the finch family, so named because of its fondness for chaff, or grain. Its loud, clear notes make it one of the most popular cage birds in Europe, especially in Germany. The chaffinch can be trained to sing distinct melodies, and almost to utter human words. The distinguishing features of the male are a bluish-gray crown, chestnut back, and black wings marked by conspicuous white bars. In England, where flocks spend the winter, the chaffinch is a common visitor of the gardens, shrubberies, and hedgerows. The nest is made chiefly of moss and wool, and contains four or five purplish-buff eggs spotted with purplish-red. The bird feeds principally on insects and their larvae (young), on grains, and on the seeds of various weeds. D.L.

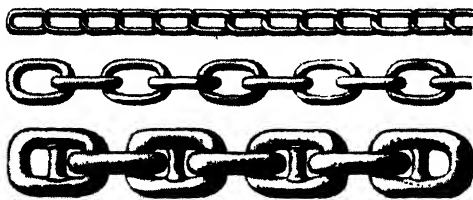
Scientific Name. The chaffinch belongs to the family *Fringillidae*. Its scientific name is *Fringilla coelebs*.

CHAGRES, chah' gres, RIVER. See PANAMA (Physical Features).

CHAIN, chane, a series of links of metal joined together and forming a flexible band. The simplest form of chain, whether large or small, consists of a series of links, each made from one piece of metal bent to the looped shape, with the ends welded together. Iron, steel, brass, and bronze are used where strength is required; gold, silver, platinum, and various alloys are used for ornamental purposes. The links of chains are sometimes made of several pieces, as in the case of bicycle chains. When great strength is required, as in cables, each link is sometimes reinforced by a brace, or stud, of metal joining the sides of the link to prevent

it from being torn asunder or compressed (see illustration). As a rule, chains are made by machinery.

Chain, a term applied to a definite measurement in surveying, and to the instrument with



THREE STYLES OF CHAINS

At top, twisted links; in center, straight links; at bottom, stud links.

which that measurement is made. The length of the original surveyor's, or Gunter's, chain is 66 feet; the actual chain consists of a series of 100 links, each 7.92 inches in length. Ten square chains, or 100,000 square links, make one acre. In surveying, a steel band or tape has supplanted the more cumbersome chain, but the term *chain* is still applied to it. The width of many country roads and of some village streets is 66 feet, this width conveniently resulting from the length of a chain. Engineers use a similar measuring device consisting of a chain 100 feet long, each link being one foot. See SURVEYING.

CHAIN OF ROCKS. See SAINT LOUIS, Mo.

CHAIN STITCH. See SEWING.

CHAIN STORES. By a group of chain stores is meant a number of mercantile establishments, under one ownership, perhaps widely scattered over the country, which deal in one general class of goods. Such a group may embrace groceries only, or drugs, or tea and coffee and package groceries, or cigars, candy, or almost any other commodity. Indeed, far separated from merchandising, there are four hundred chains of hotels, embracing 1,500 units.

The greatest chain-store development has occurred in those cities where the population is densest. The percentage of food sales of these stores has increased from a mere fraction of one per cent to as large as ten per cent of all food distribution in certain sections. It is believed that of every dollar spent in retail stores to-day, seventeen cents goes to chain stores.

Mercantile methods are being revolutionized. The system of retailing which was successful twenty years ago is to-day undergoing modification in order to survive. Mail-order merchandising has grown to such proportions that some time ago the prosperity of country stores was threatened; now chain stores are also taking toll from individual stores in thousands of cities. Small firms declare that

the system of chain stores is undermining them; that even initiative, perseverance, and good salesmanship are unable to prevail against their lure. One chain store in a community carries with it the prestige of a powerful organization against which individual competition is almost powerless. However, independent dealers are beginning to pool their buying and thus can purchase more advantageously.

The sponsors of the chain-store system, on the other hand, justify its existence by declaring that each store in such a group is reducing the cost of living; management is more efficient; profits are small on each individual sale, though admittedly large in the aggregate; such a store is strongly financed, and money is available to command low prices for purchases in very large quantities.

In 1914 there were only 8,000 grocery stores owned in groups; to-day there are 860 chain grocery companies, and they control more than 72,000 stores; they do an annual business of \$9,000,000,000. There are 790 companies that control 8,200 variety stores selling articles from 5 cents to \$1; a total of 600 companies control 6,500 shoe stores; 425 companies own 3,500 drug stores.

Figures are constantly changing, therefore statistics can never be exact; however, the following table adds approximately reliable totals with respect to other lines of chain merchandising:

FIELD	COMPANIES	UNITS
Cigars and tobacco	30	2,850
Department stores	180	2,480
Women's clothing	215	2,030
Restaurants and tea rooms.	166	2,009
Candy	33	731
Meat	52	598
Millinery	46	590
Clothing	20	531
Bakeries	12	523
Hardware and sporting goods	52	511
Men's hats	24	465
Music and radio	46	435
Stationery and books	17	356
Furniture	18	179

CHALAZA, *ka lu' zah*. See EGG (A Typical Egg).

CHALCEDONY, *kal sed' o nie*, a beautiful variety of quartz, so called because it was first found abundantly near Chalcedon in Bithynia. A little is now found in California and Colorado, and in rock cavities in Iceland and Scotland. The common chalcedony, also called *white agate*, resembles milk diluted with water, is semi-transparent, and more or less clouded with circles and spots. There are several other kinds, appearing in different colors and formations, such as agate, onyx, chrysoprase, sard, carnelian, and sardonyx, each with its special beauties. When polished, chalcedony

is valued for brooches, necklaces, ornamental boxes, cups, etc., and many pieces contain interesting vegetable fossils. In the book of *Revelation* the third foundation of the wall of the Holy City is described as being made of chalcedony. The famous agatized wood of the fossil forest in Chalcedony Park, Arizona, is caused by the action of a chalcedony deposit from water in replacing the woody fibers. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles

Agate Carnelian Onyx Sardonyx

CHALCEDONY PARK. See above.

CHALCOCITE, *kal' ko site*. See COPPER GLANCE.

CHALCOPYRITE, *kal ko pi' rile*. See COPPER GLANCE.

CHALDEA, *kal de' ah*, the name anciently applied to the extreme southern district of Babylonia, lying to the west of the mouths of the Tigris and Euphrates rivers, along the Persian Gulf. "Ur of the Chaldees" was the home of Abraham, from which Jehovah called him to begin a new life in the land of Canaan (*Genesis* XI, 31). It is supposed that the Chaldeans were a Semitic people who came from Arabia at a very early date and settled in the neighborhood of Ur. From there they began to make war upon the other inhabitants of Babylonia, and at various periods Chaldean princes sat upon the Babylonian throne. About 626 B.C. Nabopolassar founded the Chaldean (or New Babylonian) Empire, and he and his famous son, Nebuchadnezzar, made Babylonia a world power.

The last Chaldean king ruled about 556 B.C., but the union between the Babylonians and Chaldeans had by that time become so complete that in later history the terms Chaldean and Babylonian are used without distinction between the two. In the book of *Daniel*, Chaldean is applied not only to the Babylonian people but to a class of magicians.

Related Subjects. The reader is referred in these volumes to the following articles

Abraham Nabopolassar
Babylonia Nebuchadnezzar

CHALIAPIN, *shal yah' pin*, FEDOR IVANOVITCH, (1873-), a Russian basso who has won fame on the operatic stage and as a concert singer, was born in Kazan, Russia. The child of poor parents, he had a varied boyhood and youth, and was successively porter, shoemaker,

hunter, and street-sweeper. He began his musical career as a member of the boys' choir in one of the churches at Kazan, and at the age of seventeen he joined a traveling opera company. The director, impressed by the splendid promise of the lad's voice and acting gifts, encouraged him by giving him leading rôles. After two years with this organization, Chaliapin studied for a year with Usatov, in Tiflis, and in 1894 made his début in grand opera at Saint Petersburg (now Leningrad). In 1896 he began to sing at the Private Opera House in Moscow, and within a short time had won an international reputation in Europe as an interpreter of Russian basso rôles. He was sponsored by the manager of the czar's opera.

While Chaliapin's full powers were not brought to the fore when he made his American début in New York, in 1906, he created a sensation on his next appearance, in 1921, in the rôle of Boris Godunov. Later, he repeated his

success as a guest artist with the Chicago grand-opera organization. He now makes regular visits to the United States, singing in concert and with the opera companies of New York and Chicago. His outstanding gifts are a superb voice, powerful dramatic ability, and a commanding stage presence. In such rôles as Boris and Ivan the Terrible, his interpretation is a brilliant work of art, but he has great versatility. As Don Basilio, the music master in Rossini's *Barber of Seville*, he not only achieves a triumph of make-up, but shows himself to be a master of comedy.

Chaliapin came into conflict with the Russian government in 1927, because of his alleged aid to "White Russian" exiles in Paris. Accordingly, the Soviet authorities confiscated his house and property in Russia, and revoked his title of "National Artist." In 1928 he divorced his Russian wife, but made provision for her and his children.



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